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MAJOR PROBLEMS AND THE NEXT BIG STEP IN AMERICAN FORESTRY

SUMMARY OF A REPORT PREPARED
IN RESPONSE TO SENATE RESOLUTION 175

TOGETHER WITH TABLE OF CONTENTS
LETTERS OF TRANSMITTAL, AND INTRODUCTION

FROM
"A NATIONAL PLAN FOR AMERICAN FORESTRY"

By
THE FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE



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LETTERS OF TRANSMITTAL

DEPARTMENT OF AGRICULTURE,
Washington, March 27, 1933.

THE PRESIDENT OF THE UNITED STATES SENATE.

SIR: I have the honor to submit herewith a report on the forest problem of the United States prepared by the Forest Service of this Department, pursuant to Senate Resolution 175 (72d Cong., 1st sess.), introduced by Senator Royal S. Copeland.

The Department construes the central purpose of the resolution to be a coordinated plan which will insure all of the economic and social benefits which can and should be derived from productive forests by fully utilizing the forest land, and by making all of its timber and other products and its watershed, recreational, and other services available in quantities adequate to meet national requirements.

The main findings of the inquiry made in compliance with the resolution are:

1. That practically all of the major problems of American forestry center in, or have grown out of, private ownership.
2. That one of the major problems of public ownership is that of unmanaged public lands.
3. That there has been a serious lack of balance in constructive efforts to solve the forest problem as between private and public ownership and between the relatively poor and the relatively good land.
4. That the forest problem ranks as one of our major national problems.

The main recommendations, as the only assured means of anything approaching a satisfactory solution of the forest problem, are for:

1. A large extension of public ownership of forest lands, and
2. More intensive management on all publicly owned lands.

The extent to which the major problems of American forestry center in, or have grown out of, private ownership are indicated by the following:

Ninety percent of the total area of devastated and poorly stocked forest land and 95 percent of the current devastation is on privately owned lands.

Forest deterioration, which is far more extensive and hence more serious than devastation, results from cutting without regard for the future productivity of the forest, or from forest fires, or from the two combined. More than 99 percent of such cutting and 98 percent of the area burned annually is on private lands.

The public policy of passing excessive areas of forest land to private ownership and the private cut-out-and-get-out policy has wrecked or seriously reduced the productivity of the land, made it difficult or impossible to pay taxes, and hence has led to tax reversion so large in

several forest regions as to constitute virtually a breakdown of private ownership. Stability of tenure is one of the essentials for timber growing.

The overload of forest land and timber in private ownership and the cut-out-and-get-out policy have led to excessively large capital investments in manufacturing plants, high capital charges, pressure to liquidate, overproduction, demoralized prices, waste of the raw product, and large financial losses to the forest industries and chiefly to the lumber industry.

Transient forest industries resulting from the conditions described have caused far-reaching and utterly demoralizing economic and social losses to dependent industries, to local communities, and to entire forest regions. The full extent and far-reaching character of such losses has been but little appreciated.

The problem of balancing the national timber budget centers largely in private ownership because four fifths of the timber-growing land with 90 percent or more of the possible growing capacity is privately owned. The practically universal tendency under private ownership is to reduce the forest capital or growing stock below the point where satisfactory growth is possible. The forest capital of the entire East, for example, where 96 percent of the forest land is still in private ownership, must be increased $2\frac{1}{2}$ times to permit growth adequate to meet national requirements, but the current drain from cutting and losses in the East exceeds growth by nearly 29 billion board feet annually. Furthermore, we must depend upon eastern forest lands for nearly 85 percent of our forest growth.

The most critical factor in balancing the timber budget is the large saw-timber sizes, which take the longest time to grow and which now constitute 70 percent of the drain on our forests. Drain in these sizes exceeds growth by five times. This deficit has been concealed by the remaining supplies of virgin timber. But 80 percent of the remaining saw timber and 95 percent of the old growth is in the far West, and probably not much more than half is accessible and available under present conditions. The privately owned forest capital in the West is being liquidated as rapidly as possible, and if present processes continue, the same kind of a deficit will be created as in the East and the possibilities of full growth will be reduced for many years.

Private ownership of forest or of agricultural land is responsible for practically all of the critical watershed problems of the East and a substantial part of those of the West. The result is unnecessarily destructive floods, causing damages running into scores of millions of dollars and the wasting away in a few years of the soil resource which will require centuries to replace.

The largest and most critical western forest range problem is on privately owned lands where the forage cover has been reduced by half or more over large areas. The eastern problem is almost entirely one of private ownership.

The forest land problem is aggravated by still another growing out of private ownership. More than 50 million acres of agricultural land, originally timbered, have been abandoned because they were never suited for agriculture or because they have reached the sub-marginal class from erosion or other causes. The land is now idle and available for forestry. The area may become still larger in the future.

From these abandoned agricultural lands have arisen many of the most acute erosion and watershed problems in the East, as well as economic and social maladjustments of first magnitude and similar in character to those resulting from forest devastation and transient forest industries.

The unsolved problem of unmanaged forest lands in public ownership has both Federal and State aspects. The Federal problem lies in the unreserved, unmanaged, overgrazed, and too largely unprotected remnant of the public domain, about 23 million acres of which are forested. The State problem includes the forested portion of Federal grants which have never been given a legal status as State forests and placed under management and the much larger area in various stages of reversion to public ownership because of tax delinquency. Both classes are in a twilight zone. Tax delinquency is creating a new public domain not of forested land but largely, instead, of devastated forest land, and of such size that it promises to be a heavy burden. Few States have legislation that provides for a solution, and still fewer take advantage of the legislation they have.

The unbalanced character of the constructive efforts to solve the forest problem as between private and public ownership and as between relatively poor and relatively good land for timber growing is shown by the fact that nearly 90 percent of the constructive effort as measured by recent expenditures has been made by the Federal and other public agencies, and two thirds of this effort has been concentrated on publicly owned lands.

Private ownership has contributed only about 10 percent, and about half of this has gone into research, much of which is aimed at uniformity of product. Only about 5 percent of the total constructive effort has therefore been made by the owners on 80 percent of the forest land available for timber growing, which has 90 percent or more of the potential growth capacity.

From the timber growing standpoint and disregarding ownership, the concentration of some 60 percent of current expenditures, which totaled nearly \$43,500,000 in 1932 on 10 percent or even less of the possible timber production and of around 5 percent of expenditures on 90 percent or more of the possible timber production, is exceedingly poor national economy, regardless of the fact that the present effort on public lands should be strengthened.

The relation of constructive effort to other forest products than timber is similar.

The inquiry makes it more clear than ever before that the solution of our forest problem is one of our major national problems. This is indicated in part by the brief references to findings already made.

But, in addition, the solution is the only means for utilizing our forest and abandoned agricultural land, which constitutes more than one third of the total land area of the continental United States. The only other possible use is for agriculture and the area needed for agriculture has been decreasing.

The solution is the only, or the best, means for supplying wood and other renewable resources. Wood is one of the natural resources on which our civilization has been built.

Under many conditions the forest probably offers the best and cheapest method available for erosion control and stream-flow regulation. One half, or 308 million acres, of the total area of forest is classified as having a major influence on watershed protection and

three fourths as having a major or moderate influence. The forest may also be the cheapest and best and in some instances the only means for rebuilding impoverished soils on millions of acres against possible future needs for agriculture.

Already one of the great opportunities for recreation, the forest can, by taking advantage of improving transportation facilities, be made to aid materially in solving the problem of how to use the increasing leisure time of all classes of people. Forest land is the natural and often the only remaining habitat of many forms of wild life, and the same is true of forest waters for fish. Forest ranges can support millions of domestic livestock for at least a part of the year.

The solution is the only means to stable permanent forest industries, with a predepression value including forests of \$10,000,000,000 and gross products prior to 1929 of nearly \$2,000,000,000. This is also true of industries using other forest resources than timber and of a large group of other industries dependent on both.

The solution will provide an important source of employment for labor at a time when the development of labor-saving machinery makes employment a critical national problem. Our forest land in productive condition and the dependent primary forest industries alone would furnish employment for 2 million men.

The solution offers an important aid in public finance by increasing the amount of taxable property. A \$100,000,000 investment in pulp and paper plants in Wisconsin could be permanently supplied by 2 million acres of productive forest.

It offers one important means for maintaining a balanced rural economic and social structure in the parts of the country which will grow timber, by utilizing all of the land productively for the purposes for which it is best suited, maintaining industries in perpetuity, and holding a reasonable part of the population in the country in a healthy, diversified rural life.

Such considerations as these make the forest problem one of the largest which the American people have ever faced, and one of the most urgent now demanding attention.

A satisfactory solution of the forest problem will require the nearest possible approach to national planning. The laissez-faire and avowedly planless policy of private ownership is failing to meet the situation. The long-time character of forestry itself, the magnitude and cost of the undertaking, and the impossibility of doing immediately everything which must be done emphasizes the desirability of national planning.

Programs for the various activities which make up forestry, such as protection against fire, insects, and disease; extensive and intensive forest practice; provision for watershed protection, recreation, forest wild life, and for the management and utilization of forest ranges have been worked out in as much detail as present information permits and incorporated in the national plan which forms an important part of the report on the Senate resolution. The Department endorses the recommendations for these programs.

The most important recommendations growing out of the inquiry, for a large increase in public ownership and for the intensification of management of publicly owned lands, are based largely on three considerations:

1. The extent to which the major problems of today center in private ownership, and the extent to which private effort on which

we have been placing main dependence is failing to meet national needs, both despite a free hand and substantial if not adequate public aid. Public aid to private owners has in fact been more than twice the expenditures of private owners on their own lands.

2. The lack of any reasonable assurance based on experience that private ownership on the large proportion of the forest lands it now holds can or will carry through the essential, constructive programs, many of which must be of great size. These include placing an additional area of 191 million acres under fire protection and raising the standards on much of the 321 million acres now under protection, planting at least 25 million acres during the next 20 years, raising the area under intensive forest management during the next few decades to at least 70 million and preferably to 100 million acres, and the area under extensive management to at least 279 million and preferably to 339 million.

3. The belief that a greatly enlarged public ownership offers the most effective solution in the public interest and that in the long run it will be much more than self-liquidating in direct and indirect returns.

The Department therefore fully endorses the conclusions reached, that public agencies should acquire 224 million acres of forest land, including a part of the abandoned agricultural land now available, and place it under forest management at the earliest possible date following acquisition. A considerable part of this land has or will come into public ownership anyway by reason of tax delinquency. The States and their local subdivisions should take over as much of this acquisition program as their resources permit. The Federal Government should assume only that part which the States cannot carry. It is believed that the resources of the States will be fully taxed to acquire and manage 90 million acres, leaving 134 million for the Federal Government.

Although at first opposed, the national forest enterprise now has practically universal public approbation. I am convinced that the public program recommended will command equal approval in the future, and that the extension of the national and State forests recommended is as important and as necessary as the creation of the existing national and State forests. The Federal share of the proposed program, including both acquisition and the management of acquired and existing national forests, has, therefore, the unqualified endorsement of the Department.

So far as I can see, nothing can be gained and much will be lost by delay. The contribution to our national land problem will be very large, and it is a contribution which is more and more urgently needed. There should be the opportunity for the large employment of labor in constructive public works. The longer that forest devastation and deterioration continue the higher will be the cost of forest restoration. A high percentage of the initial costs are in the nature of capital investments, for which low-interest long-term loans would be justified. I strongly recommend, therefore, the earliest possible action on the Federal part of the plan.

The plan recommended goes as far as possible in coordinating the effort of all interested agencies. In the acquisition of land it is believed that the soundest principle will be for each public agency to finance its own purchases and to acquire only what it can subsequently afford to manage. The part of the undertaking left to the

private owner is believed to be within practical possibilities. A substantial increase in public aid is provided, in which the Federal Government and the States should join forces. Aid to private owners should not, however, go beyond the public interest. The States and their local subdivisions are encouraged to take on as much of the remainder of the undertaking as they can and will. This will leave for the Federal Government only what neither private owners nor the States can carry, and beyond that what is clearly within the national interest. The resolution stresses aid to the States. A detailed examination of the program proposed will show that the very liberal Federal contribution to the whole plan in the form of aid to private owners and otherwise constitutes in the last analysis aid to the States which would otherwise have to carry the entire burden.

Respectfully,

H. A. WALLACE,
Secretary.

R. G. TUGWELL,
Assistant Secretary.

UNITED STATES DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, March 24, 1933.

The SECRETARY OF AGRICULTURE.

DEAR MR. SECRETARY: I am transmitting herewith a report on Senate Resolution 175. In many respects it represents the most comprehensive and exhaustive survey yet made of the forestry situation in the United States. It goes to the full limit of possibility with the staff at our disposal and the data which could be collected and utilized in the time available.

I have been in close touch with the work from the preparation of the initial plans and have personally reviewed the entire discussion which supports the conclusions reached. In my judgment the time has come for another great forward step in American forestry, and a major portion of the step should be the public assumption of a much larger share of the enterprise. If the recommendations on this phase of the problem can be carried out and carried out promptly, it will mean the greatest advance since the creation of the existing national forests, which has been the largest and most spectacular development to date. It will be an advance of even greater magnitude. The need is also greater. This, however, is only one part of a coordinated national plan of which I earnestly recommend your approval for submission to the Senate.

A large number of Forest Service employees have participated in the preparation of this report. Lasting credit is due to Earle H. Clapp, Assistant Forester in charge of research, who made the initial plans, and by personally directing the project throughout has made possible this outstanding contribution to forestry. We have felt free to draw upon the services of other bureaus in this and other Departments where the nature of the subject justified, and I desire to make full acknowledgement of the help received.

Very sincerely yours,

R. Y. STUART, *Forester.*

A NATIONAL PLAN FOR AMERICAN FORESTRY

MAJOR PROBLEMS AND THE NEXT BIG STEP IN AMERICAN FORESTRY ¹

A SUMMARY OF THE REPORT ON SENATE RESOLUTION 175

By EARLE H. CLAPP, In Charge Branch of Research

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¹ This statement embodies the findings of all the sections of this report which follow. In a very real sense it is an expression of the findings and the conclusions reached by a large group of men. Acknowledgment is made to this entire group, which includes the authors of the sections and a much larger number of Forest Service employees and those of other organizations who aided in the collection of the data and their compilation and preparation for publication. Because references to sections would have to be exceedingly numerous, none whatever are made.

THE PROGRESS OF FORESTRY IN THE UNITED STATES

The American people have reason to be proud of the progress of forestry in the United States. In its modern phase this progress has been made largely since 1900, although it began in 1876 with the appointment of one man in the Federal Department of Agriculture.

THE FEDERAL CONTRIBUTION

To this progress the Federal Government, the States and their political subdivisions, various quasi-public agencies, and private owners, have contributed.

THE NATIONAL FORESTS

The national forest enterprise has been the most conspicuous single effort in the development of American forestry.

The great significance of the national forest enterprise lies in the fact that it has been a trial on a grand scale of Federal public administration of a great natural resource in the public interest. This has been a radical departure from the traditional American policy of private ownership of natural resources and their exploitation for private profit.

The national forests now exceed 161 million acres. The 140 million in the continental United States contain nearly one sixth of our commercial forest land or that suitable for timber growing, and 30 percent of our noncommercial forest land or that chiefly valuable for such other purposes as watershed protection and grazing. They contain one third of the remaining saw timber.

Virtually all of the major streams west of the Great Plains head in them. All of the lands purchased in the East are on the watersheds of navigable streams.

They contain 83 million acres of range lands in the West, or 12 percent of the total western range area.

Substantial or large parts of practically all the major mountain ranges in the United States fall within the national forests, which constitute the great playgrounds and include much of the most beautiful scenery of the country.

They constitute our great public hunting grounds, 75 percent of the range of the big game animals of the West, and much of the western fur-bearing area. They include 60,000 miles of streams and many thousands of lakes suitable for fish.

For all of these interrelated resources the soil is the basic resource.

Of hardly less significance in the national forest enterprise than the trial of public administration of a natural resource has been the adoption of far-reaching plans to insure both maximum use and perpetuity and the use of each forest resource in relation to all.

All of the 74,680,000 acres of commercial forest is under timber management, 21 million acres have detailed sustained yield management plans, and 29 million acres more general plans. All of the 1,250 million board feet cut annually from 125,000 acres is under silviculture which will perpetuate the forest and maintain the forest capital. About 25,000 acres are now being planted annually. The sustained yield capacity of the forest is being steadily increased.

Range management plans have been prepared or are in preparation for the entire national forest area utilized for grazing; fairly intensive plans for 33 million acres. National forest ranges now support 8 million head of cattle, horses, sheep, and other domestic livestock.

The full services which the forest and range cover can render in watershed protection are gradually being assured by the management of timber and forage and their protection against fire.

The national forests are now visited each year by more than 30 million people seeking recreation. Management plans provide for the gradual development of camping grounds, for the leasing of summer home sites, and for other needed facilities. More than 50 areas containing about 9 million acres have already been set aside to prevent needless impairment of pioneer conditions.

Under protection wild life is being gradually increased, despite the fact that 100,000 big game animals are being killed annually. As fast as the possibility of management is reached plans are prepared and put into effect.

Protection against fire is necessary in the management of all forest resources. In spite of a rapid increase in human use, the size of the area burned in the average year has been reduced from about 1,350,000 acres to about 500,000 acres between 1910-15 and 1920-25. The ratio of actual to allowable burn has been brought to 1.07 to 1. On all but 30 of the 95 million acres requiring protection a satisfactory ratio has been reached. An important factor in this improvement has been the development of detailed plans for fire protection.

In normal years business for the entire national forest area includes, in part, more than 80,000 individual business transactions, some of great size; the administration of all use; the control of some 8,100 forest fires; the planting of 25,000 acres; the planning and construction of nearly 4,000 miles of roads; of more than 8,500 miles of trail; the purchase of 450,000 acres of forest land. Aggregate expenditures in 1930 reached more than \$11,500,000 for administration and protection and \$6,000,000 for capital investments. Receipts were nearly \$7,000,000.

A competent staff has been developed, the stability of which is assured by civil-service protection, a stability common to all Federal agencies engaged in forest activities.

Opposition to such a radical departure as the national-forest enterprise was inevitable. Violent to begin with and still sporadically recurrent, it is gradually decreasing. In general the national forest concept of Federal administration in the public interest of a great national resource under a policy of integrated sustained yield management has become an accepted fact in public opinion. Although facing many unsolved problems of administration, resource management, and protection, the national forests are an outstanding example of land administration and of public administration of any sort. Forty years' trial has built up the resource itself, despite continuously enlarging use. The national forests have become a vital part in the existence of local communities and even of whole States, the source of being of many industries, and the opportunity for the employment of labor. They are already showing something of the magnitude of the economic and social services which the sustained yield forest can render, but the full possibilities are far in the future.

NATIONAL PARKS

The Federal contribution to American forest land use has also included the creation and administration of the national parks. Their 4½ million acres of forest enhance many of the finest and most unique scenic areas in the United States.

Although their primary service is inspirational and the commercial utilization of timber and forage is not permitted, much of the national park forest affords valuable watershed protection.

Within their own specialized field of land use the national parks have pioneered and have developed highly intensive plans and management and a personnel for this specialized work. The Yellowstone, established in 1872, was the earliest venture of this kind.

THE INDIAN FORESTS

Paralleling the national forest concept of public administration of forest land in the general public interest is the Federal administration of the Indian forests for the Indian wards of the Government. Indian reservations include about 7½ million acres of commercial forest land.

Detailed sustained-yield-timber-management plans are in effect on about 5 million acres, and all timber is being cut in compliance with sound silvicultural principles. General range management plans have been prepared for 12 and fairly intensive plans for 3½ million acres, and the administration of range use is being rapidly perfected. Fire-protection standards are being raised, and the protection of watersheds is gradually improving.

FEDERAL AID

In addition to the administration of nationally owned and Indian lands the Federal contribution to American forestry takes the form of financial aid to the States and private owners of forest land.

The national interest in making forest land productive would in itself justify such aid, but it is also an effort to stimulate both State and private effort.

An annual contribution of about \$1,575,000 for fire protection in 1932 is now helping to make possible the protection of nearly 230 million acres in 40 States and the reduction of the area burned to less than 2 percent annually, in contrast with nearly 20 percent on unprotected lands.

About \$80,000 aids in the annual distribution of 25 million forest tree seedlings at low cost in 38 States; about \$70,000 in the assistance of nearly 10,000 farmers in woodland management. Annual appropriations and the income from land-grant endowments totaling about \$3,500,000 aid in the support of colleges of agriculture in nearly 40 States, in 16 of which instruction in forestry leading to a degree is given. Only a small part of an annual contribution of \$4,320,000 to State agricultural experiment stations is used for forest research, but may help to release a larger sum of State appropriations for this purpose.

Large Federal land grants to the States, although not so intended, have been the foundation for Western State forests and in part those of the Lake States.

Indirectly the annual Federal-aid road contribution, which reached nearly \$135,000,000 in 1931, has had important but not measurable value in improving transportation facilities for forest products, and hence in creating more favorable conditions for timber growing.

The main results of Federal financial aid have been—

The stimulation of State effort. It has been an important factor in the establishment of 12 State forestry departments, the initiation of fire protection of private land in 17 States, the enlargement of the protected area of State and private lands by nearly four times, the initiation of nursery stock distribution in at least 12 States, of farm wood-lot extension in 33 States and 2 territories. State expenditures for aid have increased from possibly \$500,000 in 1911 to nearly \$5,500,000 in 1932.

The stimulation of private effort. Private expenditures for organized fire protection have grown from about \$55,000 to \$1,000,000 between 1911 and 1932. Private owners probably supplement the organized effort with the expenditure of an additional \$300,000. The expansion in other phases of private effort have probably not been in the same proportion.

RESEARCH

Forest research in the Department of Agriculture is based upon the Federal responsibility for work on national, interstate, or regional, and international problems, and also local problems where the administration of Federally owned or managed forests is involved. It has important aid aspects.

A national plan designed to meet these Federal obligations has resulted in the establishment and concentration of the work largely at a series of regional forest experiment stations and a national forest products laboratory.

Practically the entire field of forestry is being covered, including the establishment, growing, and management of forests; their protection against fire, insects, and diseases; the management and utilization of forest ranges; erosion control and stream-flow regulation; the utilization of forest products; forest wild life; and forest economics. A scientific basis for the practice of forestry and the economic basis for national and regional forest land planning adapted to American species, conditions, and requirements are gradually being developed.

Expenditures for 1932 total about \$3,000,000.

THE STATE CONTRIBUTION

STATE ORGANIZATIONS

Forty-two States now have legal provision for work in forestry and in all but five an organization has been set up. This marks progress since the beginning by California, New York, Ohio, and Colorado in 1885.

Great differences in regional conditions and problems, in the aggressiveness of leaders and opponents, in public opinion and the attitude of the press, have caused State activities to vary within wide limits and except for Federal leadership the variation would have been much greater.

STATE AID

All of the States except Arizona, Missouri, and South Dakota now give some or all of their forest landowners more or less aid. Expenditures for this purpose reached nearly \$5,500,000 in 1932.

Aid, and more specifically in fire control, is in fact the chief job of nearly all the State organizations. Expenditures for fire reach nearly 60 percent of the total for all aid. Those for fire, disease, and insect control reach nearly 90 percent, but aid is also extended in planting, research, and advice to forest landowners, mainly farmers.

More than 80 percent of the expenditures for aid are concentrated in the New England, Middle Atlantic, and Lake States.

The States maintain all but 3 of the 25 forest schools of collegiate grade in the country on which they are expending about \$925,000 annually. They are training more than 95 percent of the professional foresters.

STATE FORESTS AND PARKS

The entire area of State forests, now nearly 4½ million acres, is under some degree of administration, mainly fire protection. About 1 million acres are under timber management plans. Nearly 5½ million, including some State land not having formal legal status as State forests, are managed with reference to future timber production. About 75 percent of the total area of State forests is in Pennsylvania, Minnesota, and Michigan.

State parks total nearly 2,700,000 acres, four fifths in New York under a high degree of administration for recreational use.

State-owned lands not in either formally designated State forests or parks aggregate nearly 6,150,000 acres, more than half in Washington, Minnesota, and Idaho. Most are under protection; in some the cutting of timber is regulated. Since these lands have no clearly defined legal status as either forests or parks, the area as a whole is in a twilight zone.

Nearly 90 percent of the organized and formally designated State forests and parks are in the Northern, Middle Atlantic, and Lake States, and more than 85 percent of all State-owned forest land is in the Atlantic and Lake States and the Pacific Northwest.

The holdings of the wealthy Middle Atlantic and New England States have been acquired largely by purchase, those of the Lake States through tax delinquency and Federal grants, and those of the Northwest from Federal grants, under stimulus of the national forests. Elsewhere State forests are practically nonexistent.

An additional 2¼ million acres is definitely in process of acquisition for State forests, nine tenths in Minnesota and Wisconsin. A very large but unknown area is reverting to State ownership through tax delinquency. Michigan, New York within the forest-preserve counties, Virginia, and South Carolina have made legal provision for the consolidation of suitable delinquent lands into State forests. The New York 20-year program for the acquisition of submarginal agricultural lands and their reforestation is unique in its anticipation of this problem.

In general the creation and administration of State forests and parks have been given secondary consideration. They are more difficult to handle than fire control, the principal State activity.

Much greater emphasis and even a realignment of personnel will be required if they are to occupy the place they can and should. One State—New York—gives the head of its forestry work the protection of civil-service standing by law, and six give this protection to officers in lower positions.

State expenditures for all forest activities totaled about \$9,000,000 in 1932.

PUBLIC REGULATION

State effort in public regulation has been mainly in legislation dealing with the use of fire and its enforcement. Nearly all States have such fire legislation, a few are enforcing it effectively, and many make some attempt at enforcement.

OTHER PUBLIC FORESTS AND PARKS

Nearly 1,000 county, municipal, and town forests now aggregate about 1 million acres.

County forests of slightly more than half the total area have significance in Wisconsin chiefly, and in New York. Two fifths of the Wisconsin forests, originating in tax delinquency, are under administration.

Probably half the number and four fifths of the area of all municipal and town forests protect municipal water supplies and are under intensive protection and administration for this purpose. Many have recreational significance.

In 29 of the 48 States tax-delinquent lands revert to the counties or towns. The area of forest land already delinquent has reached many millions of acres. Some provision for consolidation and administration as county forests or for transfer to the State or for administration by the State has been made by law in Wisconsin, Oregon, and Minnesota.

Total expenditures by the political subdivisions of States in the field of forestry were about \$1,650,000 in 1932.

THE PRIVATE OWNER'S CONTRIBUTION

Nearly 400 million acres, or practically 80 percent of the commercial forest land in the United States, is in private ownership, and 127 million acres of this is in farm woodlands.

By far the largest conscious contribution of the private owner to American timber production is in fire protection. Toward the cost of organized protection on about 225 million acres, as already indicated, the owners contributed approximately \$1,000,000 in 1932, or about one sixth of total expenditures. For the 2 preceding years the contribution was between one fifth and one fourth. Nearly 20 million acres more are protected by the owners themselves at a cost of about \$300,000.

Organized sustained-yield management for areas exceeding 1,000 acres is believed to be in effect on about 2.3 million acres; and measures other than fire protection to prolong productivity, on more than 15½ million acres. The extension over the entire farm-woodland area of fragmentary data from New England indicates active efforts to promote tree growth on about 4 million acres. Private owners

have planted about 1.2 million acres and are adding to this at the rate of about 50,000 acres annually.

Great credit is due to the group of private owners who have pioneered in forest management on their own lands.

Research expenditures by private owners reach about \$2,500,000 annually. Pulp and paper manufacturers are responsible for four fifths of the total and concentrate their efforts largely on manufacturing technique to insure uniformity of product. It may be much more than a coincidence that the wood products on which most research is being done are also those on which the use is increasing rapidly. Practically the entire expenditure for research deals with the utilization of forest products.

Total expenditures by private owners probably therefore total somewhat over \$5,000,000, half of which is for research.

THE CONTRIBUTIONS OF OTHER AGENCIES

Scientific organizations and forestry and conservation associations have exerted an important influence as leaders in the development of public-forest policies and the awakening of public sentiment.

The American Association for the Advancement of Science initiated the movement which started forestry as an organized and permanent activity in the United States Department of Agriculture in 1876. This association was active also in obtaining the passage of the act of 1891 which authorized the setting aside of the "forest reserves" from the public domain.

A committee of the National Academy of Sciences formulated the recommendation which was the basis for the act of 1897 providing for the administration of the "forest reserves."

The American Forestry Association since its organization in 1875, and the American Tree Association since 1922, have played a very large part in arousing and organizing public sentiment in support of Federal and State legislation. So also have numerous State forestry associations, among which the Minnesota, Colorado, Pennsylvania, and Massachusetts associations and several in southern California are or have been notable. Among other activities the Society for the Protection of New Hampshire Forests has for years aggressively supported Federal acquisition of forest land. Regional associations, including the Western Forestry and Conservation Association, the Southern, and more recently the Central States Forestry Congresses have performed similar services.

Several endowed research institutions include forest research of a fundamental character in their field of work and are now expending about \$230,000 annually.

The endowed forest schools, although limited in number, have exercised a pronounced leadership in both education and the national development of forestry.

PROGRESS IN SUM

Progress in American forestry to date has put approximately 110 million acres under conscious effort other than fire protection to prolong the productivity of the forest for timber growing. Perhaps 30 million acres of the total is under fairly intensive timber-management plans and twice as much more under more general plans, the outstanding feature of which is sustained yield.

Approximately 10 million acres are cut over annually, and of this perhaps one twentieth is consciously cut under more or less intensive silvicultural principles. The total area planted is about 1,900,000 acres and is now being increased by 153,000 acres a year.

Out of a total area of 334 million acres of forest lands grazed some kind of management plans are in effect or are under preparation for about 85 million. For perhaps 40 million the plans are intensive.

About 8 million acres are under intensive management for recreational purposes, not including the areas within the national forests.

Protection of forest wild life on the national forests and parks and in several of the States, particularly in the Northeast, has permitted game to increase materially in numbers during the last few years. Management plans are a development of the last decade. Fish have been introduced into forest waters in which they did not previously occur. Material progress has been made in the artificial propagation of fish and the development of fish-hatchery technique.

More or less intensively organized fire protection, at an annual cost in 1932 of \$14,475,000, has been put into effect on a total of 321 million acres, of which about 290 million is commercial forest land.

Forest insect control has been developed for bark beetles in the West, and gypsy and brown-tail moths in the East. Annual expenditures for control by all agencies on some 80 million acres is estimated at \$2,100,000.

Organized control of forest tree diseases is largely confined to the white pine blister rust on an area of some 10 or 12 million acres. This, with other small eradication jobs, is done at a cost of about \$1,000,000 annually.

Research by all agencies now covers practically the entire field of forestry and called for an expenditure of about \$6,315,000 in 1932.

The first college giving instruction leading to a professional degree in forestry was established in 1898. There are now 24. The number of trained professional foresters has reached a total of about 4,500 and is being increased by about 400 annually.

Total expenditures in 1932 by all agencies in the entire field of forestry were about \$43,475,000 (fig. 1). To this the Federal Government contributed about \$26,965,000, the States and their subdivisions \$10,650,000, private owners \$5,060,000, and quasi-public agencies \$800,000. The expenditure of public agencies were, therefore, nearly 90 percent of the total.

Public regulation of private lands, centering mainly in the use of fire, has been gradually building up in legislative provisions in many States. Enforcement varies from States in which it is thoroughly effective to those in which nothing is attempted. A part of the value of the fire legislation has been in the reduction of public carelessness with fire on public forests.

Public aid designed both to meet public obligations and interest and to stimulate private ownership began as early as 1885 and has developed much more rapidly under the stimulus of Federal legislation, particularly that of 1911 and 1924.

The greatest contribution of public aid to private effort has been in putting under fire protection half of the privately owned forest land needing it. In various forms it is partly responsible at least for stimulating other measures to insure productivity on about 25 million acres of private land, including the planting of 1.2 million acres.

Federal aid has been a factor of primary importance in initiating or strengthening forestry organizations in practically all of the 42 States in which one now exists. Aid to private owners is the chief activity of nearly all State organizations.

The most conspicuous contribution of private owners has been in fire protection, to which they are devoting more than one fifth of their current expenditures, approximately \$5,050,000 for 1932. Considerably less than half of the \$2,500,000 expenditure for research is designed to add to basic knowledge of forest products.

The most spectacular advance in American forestry has been the building up of the national forests from the public domain, which culminated in 1910 with a gross area of nearly 195 million acres.

Since that time the total area of public forests has changed but little, despite the purchase of 4,727,680 acres and other enlargements

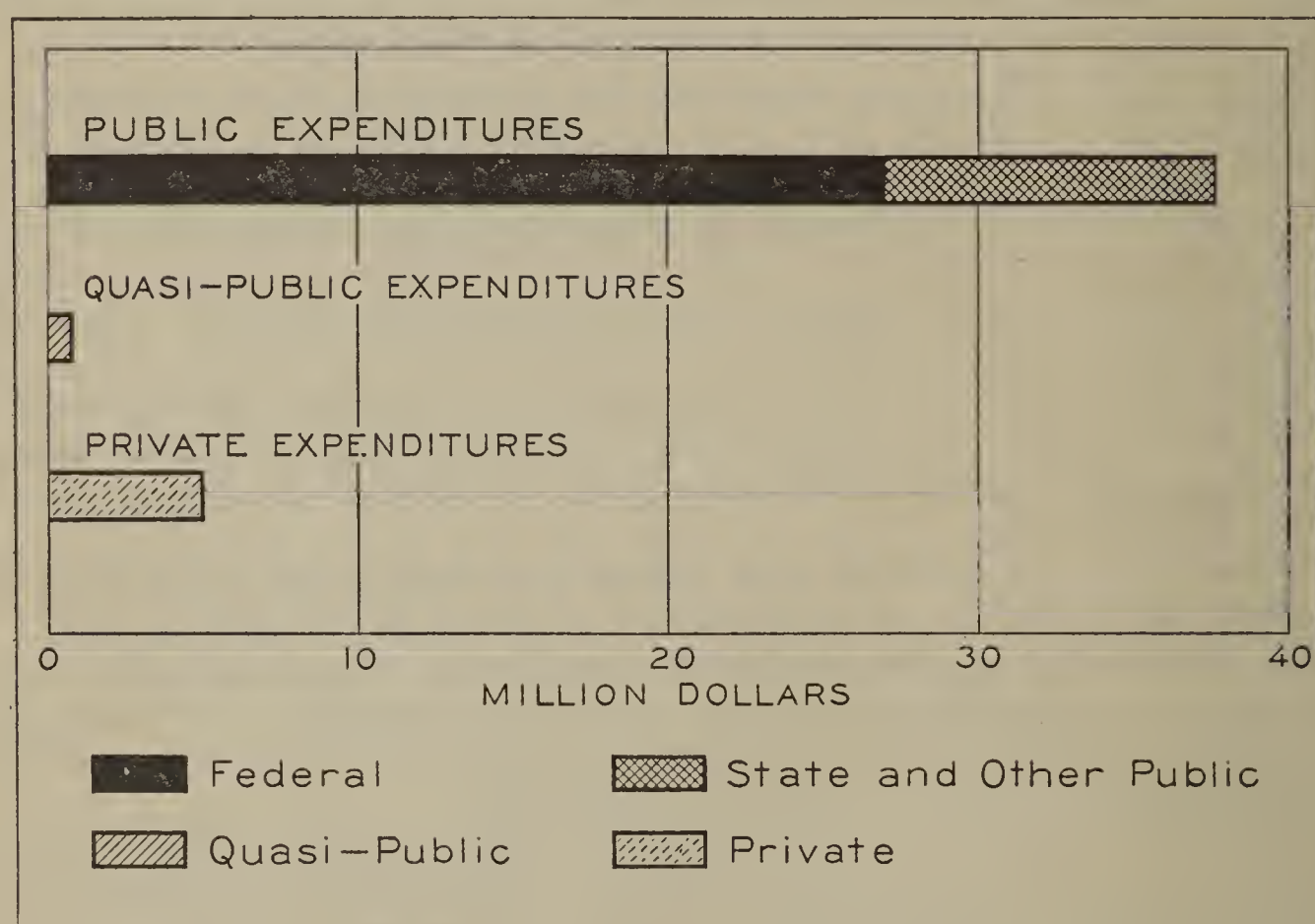


FIGURE 1.—The most significant features in the American 1932 bill for forestry were its total of nearly \$43,500,000, and the public contribution of well toward 90 percent.

for the national forests and the gradual building up of State forests. The total net area of all public forests, including interspersed non-timbered lands, is now about 175 million acres.

The period subsequent to 1910 in public administration has largely been devoted to a consolidation of gains. Practically the entire area has been put under more or less intensive sustained-yield management plans for timber, ranges, watershed protection, recreational and other use, and protection against fire. Methods of administration have been developed and perfected. While the need for improvement in technical management and business administration will continue for years to come, much of the most difficult pioneering period has been passed. Public opinion has in general been won over from violent opposition to aggressive support.

If the public need warrants such action, American forestry is now ready for another great advance.

THE MAJOR FOREST PROBLEMS

Despite some reason for gratification in past accomplishments, the American people have no reason to be proud of what still remains to be done to put forestry on a satisfactory footing in the United States.

What is still needed falls logically into a group of major forest problems. Some of these problems have to do with the productive use of land as influenced by ownership and management. Others center in timber, watershed influences, and the other chief products and services of the land. Another deals with the knowledge which must be available for the solution of the problems.

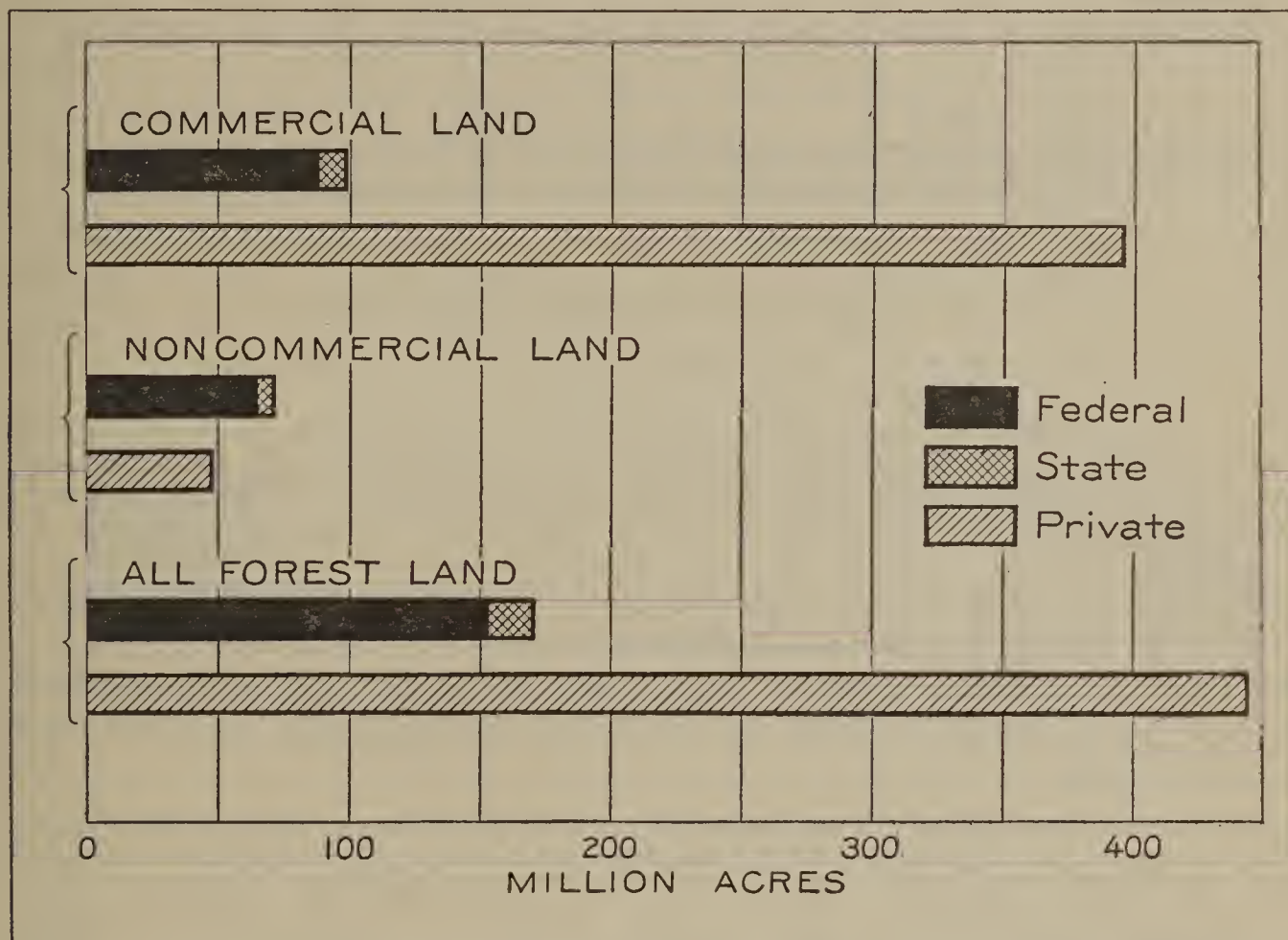


FIGURE 2.—Ownership of four fifths of the commercial or timber-growing land has given the private owner the opportunity to dominate American forestry for better or worse, an opportunity made even more favorable by the quality of the land. "All forest land" includes some reserved areas.

THE PROBLEM OF PRIVATELY OWNED FOREST LANDS

As already indicated, nearly 400 million acres of commercial forest land is in private ownership, 270 in industrial holdings and 127 millions in farm woodlands.

IT IS THE MOST IMPORTANT TYPE OF OWNERSHIP

Private ownership is by far the most important class because of its great area and also because it includes the great bulk (fig. 2) of the most highly productive, the most accessible, and most easily logged forest land in the country. Still further, nearly 60 percent of the most accessible remaining saw timber is on private lands. More than half of the remaining saw timber is industrially owned.

IT IS LARGELY RESPONSIBLE FOR FOREST DEVASTATION AND DETERIORATION

Of the 83 million acres of devastated or poorly stocked forest land, 74 million, or nine tenths (see fig. 3) is privately owned, and an appreciable part of the remainder reached this condition before coming into public ownership or as a direct result of private operations and ownership.

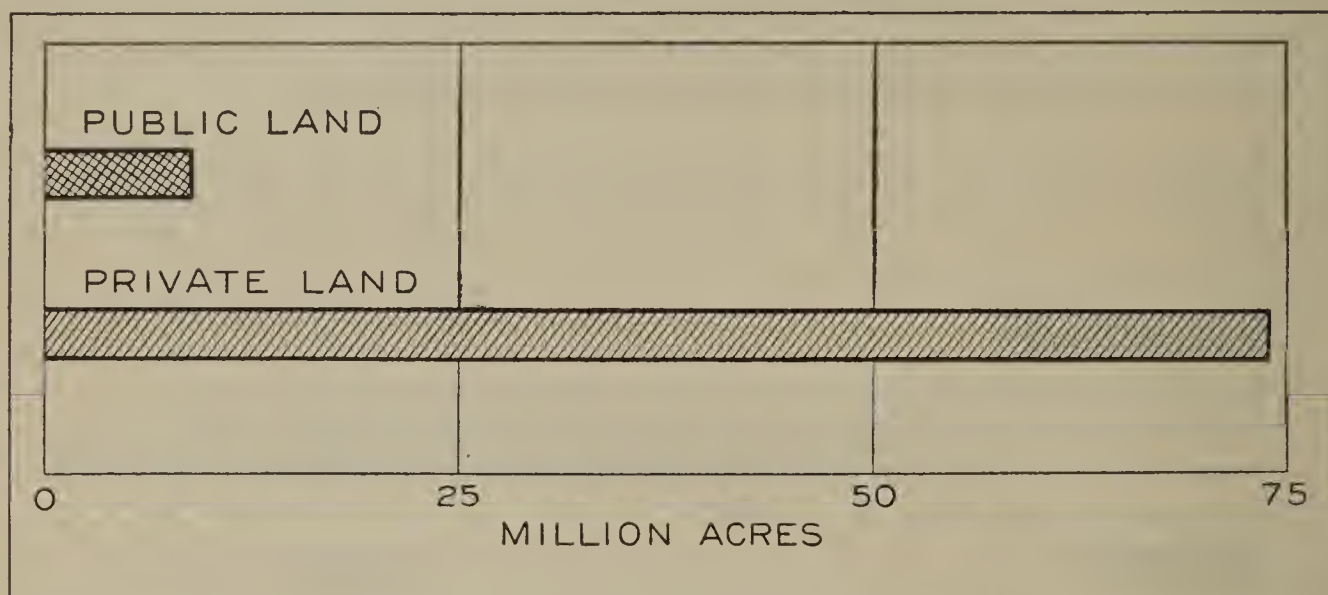


FIGURE 3.—The large proportion of the area of devastated or poorly-stocked forest land in the lower bar does not tell the full tale of responsibility, since private ownership must also answer for a part of the 10 percent now publicly held.

Of the 850,000 acres devastated each year about 95 percent are in private ownership, as shown in figure 4.

At least 36 million acres of forest are being deteriorated annually, primarily as a result of poor silvicultural practice and unsatisfactory fire protection.

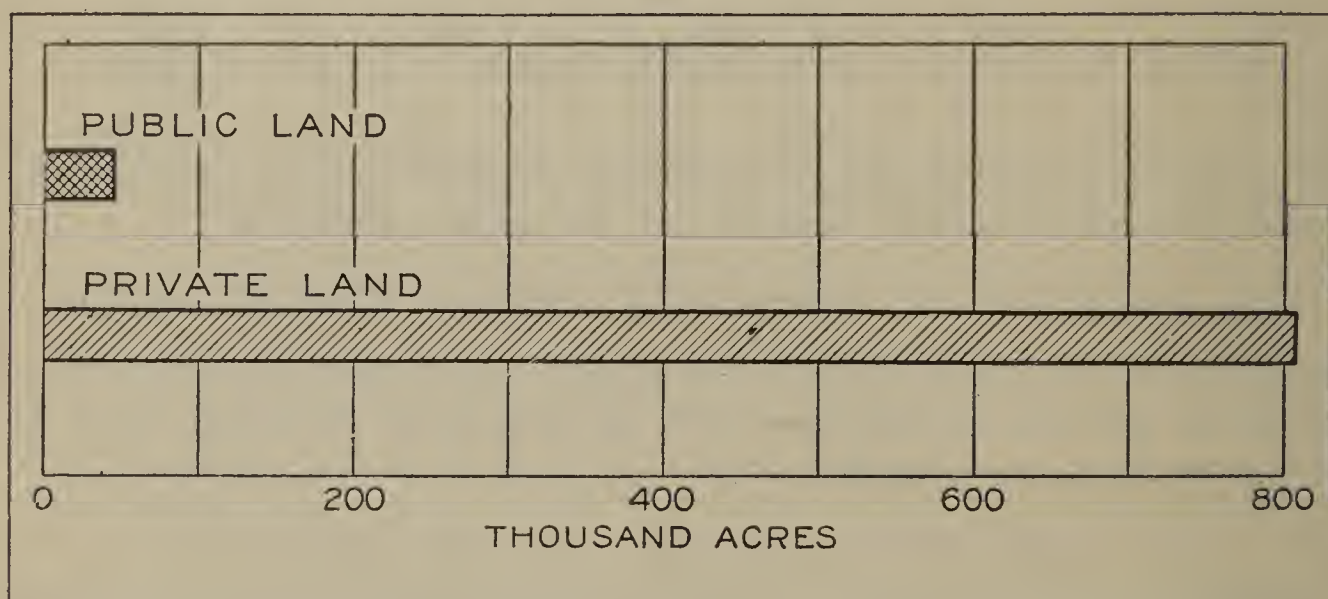


FIGURE 4.—The area of forest land devastated annually. While the current annual rate may be offset in part or altogether by the return of other lands to productivity, the long delay is a heavy drag on the forestry enterprise for which private ownership is chiefly responsible.

The extent to which private ownership is responsible is shown by the fact that more than 98 percent of the 10 million acres cut over each year is privately owned, that fully 95 percent of the private cutting is probably made without any conscious regard to the future productivity of the forest, and that nearly all of the cutting on publicly owned forests is designed to perpetuate the forest. Figure 5 shows these relationships.

It is shown further by the fact that nearly all of the 191 million acres of forest land needing but not given protection is in private ownership

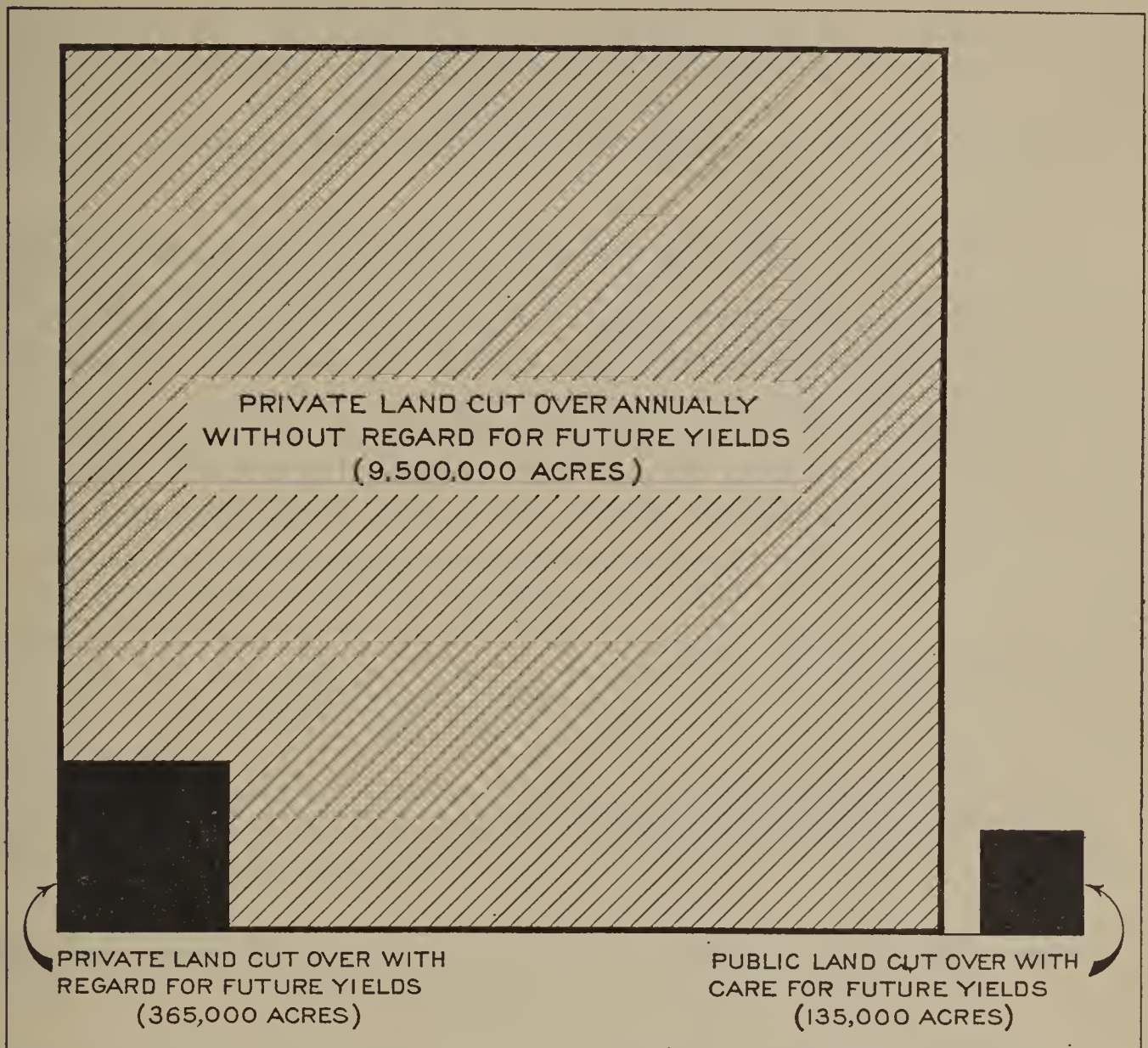


FIGURE 5.—The annual cut, public and private. The large area of private land cut over each year without conscious effort to promote forest growth accounts in part for the 808,000 acres of private land devastated annually and the much larger area deteriorated. Practically all public land is cut with the perpetuation of the forest in view.

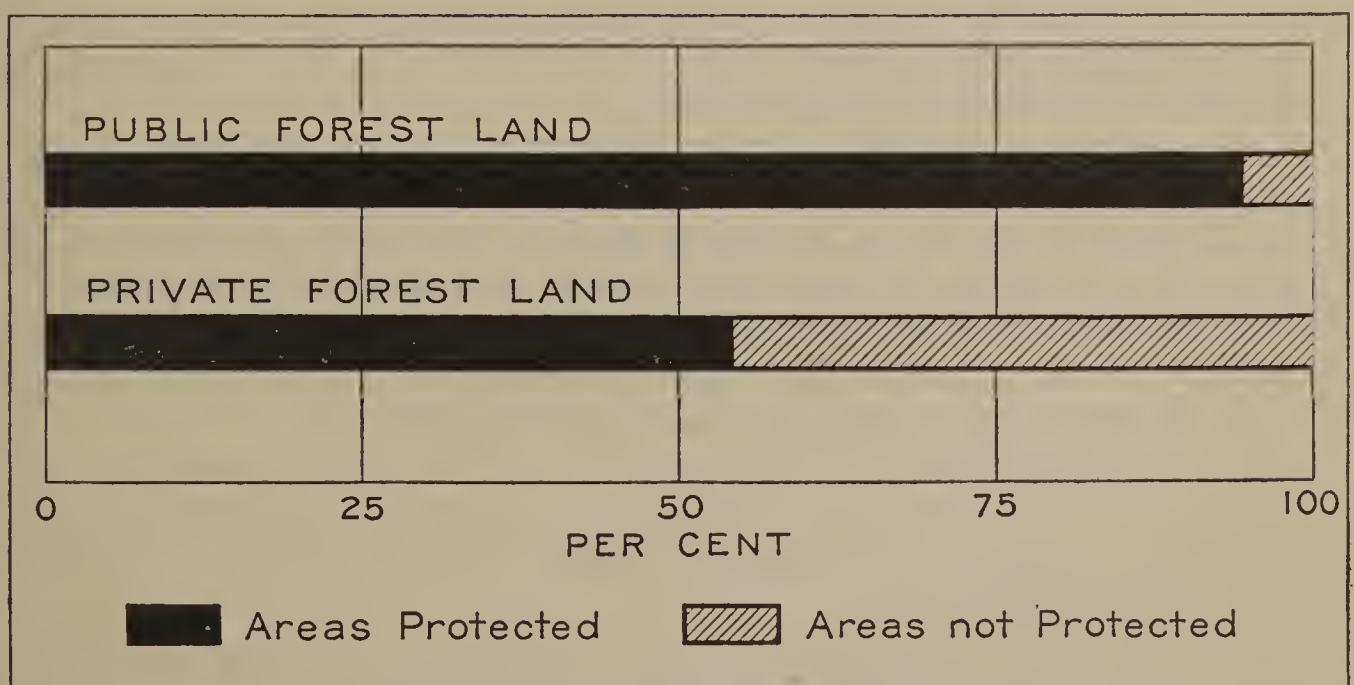


FIGURE 6.—Absence of protection on nearly half of the private lands needing it is one of the main factors in the excessive contribution of private ownership to forest devastation and deterioration.

(fig. 6) and that at least 41 million acres, or about 98 percent of the area burned annually during the last few years, is privately owned (fig. 7).

It is still further shown by the depletion of the forest capital or growing stock of the forests of the entire East, 96 percent of which are still in private ownership and practically all of which reached their present condition in private hands. Forest capital is as necessary to high production of desirable products in timber growing as financial capital is to the development of industry. In order to raise growth to the level of current requirements the growing stock must first be increased nearly $2\frac{1}{2}$ times.

IT IS THE MOST UNSTABLE FORM OF FOREST-LAND OWNERSHIP

Because of the long time required to grow forest crops and the necessity for long-time planning and continuity of policy, stable land ownership is a *sine qua non* to the practice of forestry.

The instability of private ownership is evidenced by the fact that about 25 million acres of forest land, largely industrial, is now tax delinquent in three regions alone, the Lake, Southern, and Pacific

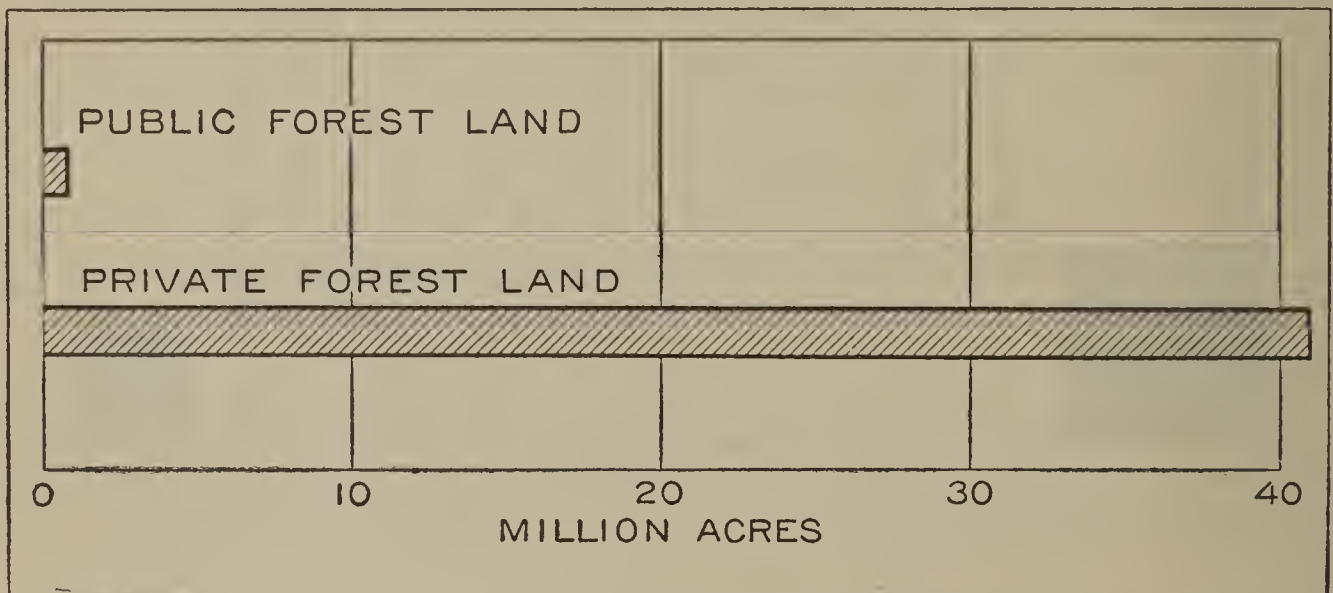


FIGURE 7.—Area of forest land burned annually. Protection of only 54 percent of the area needing it helps to explain the responsibility of private ownership for 98 percent of the area of forest land burned over annually in the United States.

Coast States, that the area for the entire country is much larger, and that the actual total is largely masked by the form of State laws and the character of their administration.

Delinquency long existant has been greatly accentuated by the depression and promises to become larger. More than one third of the forest land in the Lake States is already virtually abandoned, and half promises to be in involuntary public ownership in 10 years.

The instability of private ownership is also evidenced by donations of land to public agencies or offers of donations in large blocks and by offers of exchange and of sale at bargain prices.

A new public domain of great magnitude is being created, before the problem of the existing public domain has been solved. It is no exaggeration to say that there is virtually a break-down of private forest-land ownership.

The cause lies in the public policy of passing excessive areas to private ownership, in the cut-out-and-get-out policy which has wrecked the productivity of the land, and in the resulting inability of owners to pay taxes on nonproductive lands.

IT IS RESPONSIBLE FOR SERIOUS ECONOMIC DIFFICULTIES IN THE
FOREST INDUSTRIES

The economic difficulties of the forest industries have not been studied in connection with Senate Resolution 175. The time has not been available, and the Timber Conservation Board was created primarily to cover this ground. No survey of the forest situation in the United States can, however, be complete without reference to them. The difficulties of the lumber industry, which is by far the largest of the forest industries, are undoubtedly the most critical.

The following brief and incomplete résumé is based in part on statements made by representatives of the industry to the Timber Conservation Board and so far made public. All of the statements indicate that the overload of forest land and timber is the basic cause.

The most critical example is probably in the west coast industry, where the investment in nearly 350 billion feet of standing timber is placed at slightly more than \$500,000,000. Excessive land and timber holdings in the west coast industry are in part responsible for excessive capital investments in logging improvements and equipment, manufacturing plants, and possibly also working capital, which together add about \$335,000,000 to the investment for land and timber.

The resulting fixed and largely inescapable capital charges on the largest annual cut of west coast timber so far made, including interest on indebtedness, taxes, fire protection, and insurance, total \$2.983 per M board feet.

Excess manufacturing capacity is shown by West Coast Lumber Association surveys. The installed normal operating capacity was slightly in excess of 14 billion board feet annually. In 1928, 72 percent of this capacity was utilized; in 1929, 73 percent; and in 1930, 54 percent. Plant capacity for the entire country is undoubtedly far more in excess of needs than that shown for the west coast industry.

Overproduction, also cited as one of the most serious problems of the lumber industry, grows in part out of an overload of stumpage and forest land, the consequent financial pressure to liquidate, the development of excessive plant capacity, and the burden of high and largely fixed and inescapable capital costs. Manufacturers have accordingly believed that they would lose less money by running than by shutting down. Uneconomic manufacture, overproduction, and demoralized prices have been the inevitable outcome.

The overload of forest land and timber is also responsible in part for wasteful utilization. A Forest Service survey in the Douglas fir region indicates waste of over 6 million cords of sound wood resulting from logging operations annually. It includes 1.7 billion board feet of material suitable for conversion into lumber, or nearly one sixth of the 1926 cut.

The cause of such waste is overproduction, which leads to "skimming the cream" of raw material. And overproduction goes back in large part to an overload of forest land and stumpage. West coast overproduction and the resulting low lumber prices have, for the time being, handicapped the efforts of owners who have desired to grow timber on their own lands in all of the important forest regions of the East which can be reached by water shipments of lumber at low freight rates.

The underlying cause of the difficulties of the forest industries and particularly the lumber industry, which may be most acute on the west coast, is only in part the overload of forest land and timber. The cut-out-and-get-out policy which has been followed almost universally is also a primary cause.

Sustained yield management would in many cases have required smaller plant capacity, lower investments, and hence carrying charges and capital costs. It would have resulted in lower operating costs from leaving unprofitable timber in the forest to grow, and higher returns from a larger percentage of high-grade material. It might also have resulted in curtailed production. The residual value of a growing forest would have been high as compared with bare land. In brief, devastation has resulted in losses which might have been profits under sustained yield management.

The entire difficulty is merely another phase of the larger problem of private ownership.

IT IS RESPONSIBLE FOR SERIOUS ECONOMIC AND SOCIAL LOSSES TO THE PUBLIC

The economic and social losses to the public extend far beyond the forest industries themselves.

Dependent industries soon succumb after the departure of the forest industries, the tax base is reduced, and local rates must be higher on the remaining property. Tax receipts of local political units fall and many become bankrupt. Outside contributions for local governmental activities become necessary. The standards of community life in schools, churches, roads, etc., are lowered. The population necessarily becomes shifting and labor transient. All possibility of a balanced economic and social structure to which productive forest land and permanent forest industries should contribute is lost for many years.

IT HAS FALLEN FAR BEHIND PUBLIC OWNERSHIP IN MANAGEMENT AND ADMINISTRATION

Practically the entire cut on publicly owned forest land is now made with provision for the renewal of the forest (fig. 5), but probably less than 5 percent of that on privately owned land. The cut on privately owned land is more than 70 times larger.

Although the area of publicly owned commercial forest land is only one fourth that of private, 10 times as much public land is being managed under intensive sustained yield timber management plans and about 4 times as much with conscious effort to prolong productivity (figs. 8 and 9).

One hundred and two million acres of the western forest ranges are in public and 42 in private ownership. The area of public ranges under some kind of management plans is about 16 times, and that under fairly intensive management plans about 12 times those in private ownership (fig. 10).

The area of publicly owned land now being planted is about twice that privately owned.

A little over half of the privately owned land needing protection against fire is under organized protection, but with a public contribution of five sixths of the cost. Practically all of the publicly owned

forest needing it receives some protection. The ratio of actual to allowable burn on private lands is about 11 to 1, that on the largest area of public lands—the national forests—is about 1.07 to 1.

While about 1.25 billion board feet are being cut from the national forests, which include 75 percent of the publicly owned commercial forest land, the possible sustained yield cut has been raised steadily.

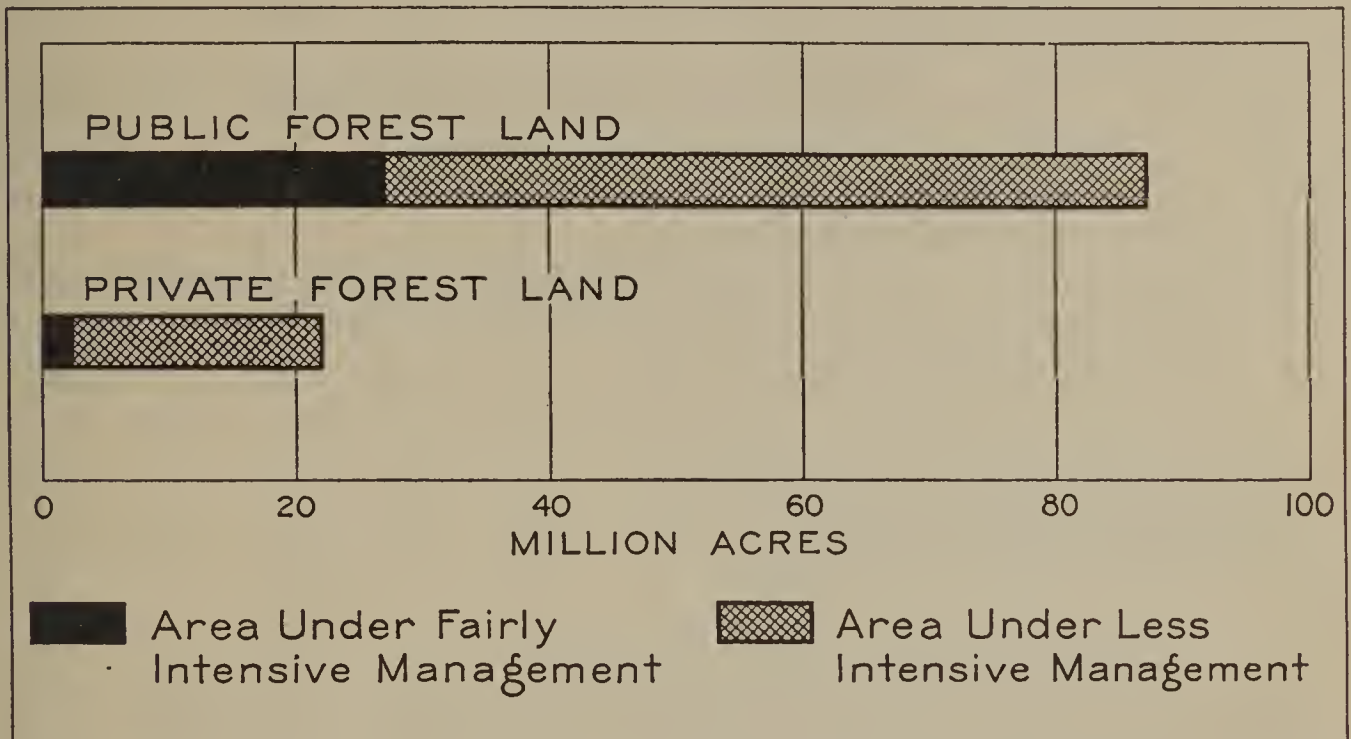


FIGURE 8.—The low acreage in private ownership under some form of forest management throws public accomplishment into high relief. The public total is, however, relatively small in the light of the effort needed to meet national timber requirements.

For the country as a whole, however, where the condition is dominated by private land, the drain for timber of all sizes now exceeds growth by nearly 2 to 1, while for saw timber it is 5 to 1. But 70 percent of the drain is still in saw timber sizes.

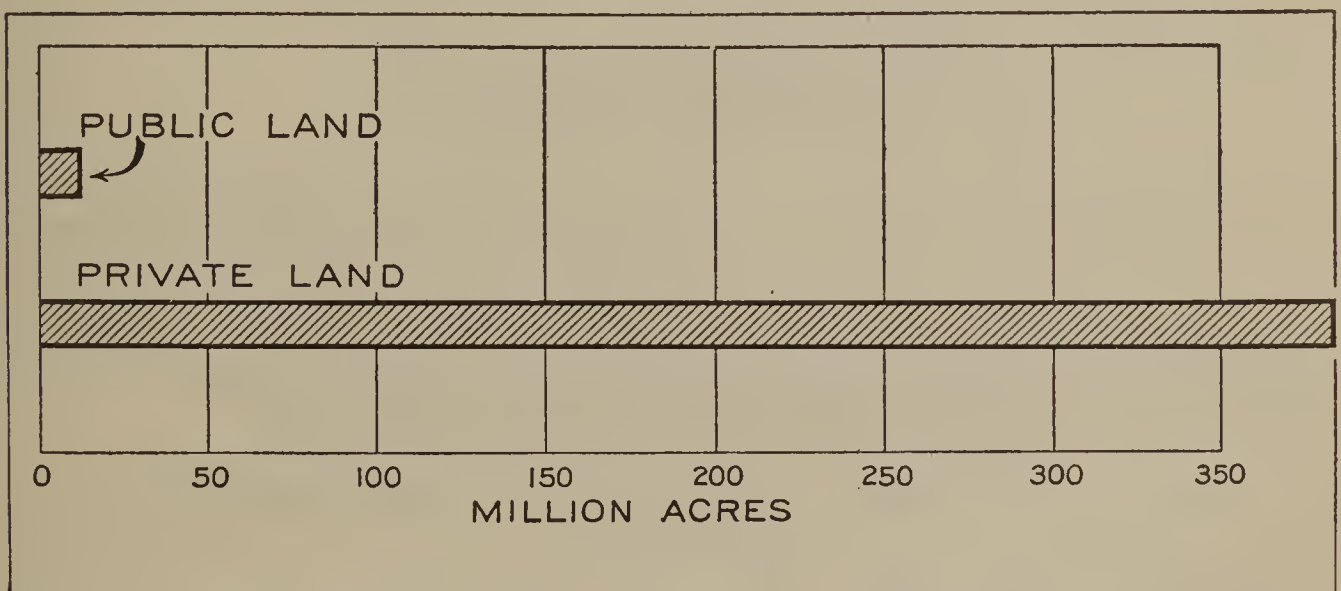


FIGURE 9.—Area with no forest management. While some of the large area in private ownership, which contains the best timberland, may remain productive, much of it deteriorates, the forest capital is reduced, and yields are less than management of any sort would produce.

While farm woodlots ordinarily receive far less attention than any other part of the farm, cutting practices have been much less destructive than on industrially owned lands. Isolation has been a factor in much better protection.

The remarkable recuperative power of the forest, rather than any conscious effort by private owners, has been the main factor in the

existence of 81 million acres of second-growth saw timber, 105 bearing young stands of cordwood size, and of 90 with fair to satisfactory restocking.

The public employs about five times more trained professional foresters than do private owners.

The relative efforts of public and private agencies are perhaps roughly expressed in the expenditures for 1932 already stated and shown graphically in figure 1.

About two thirds of the public expenditures, which are nearly 90 percent of the total for the year, are devoted to public lands and mainly to the commercial forests which constitute only one fifth of the total area of commercial forests.

Less than half of the private expenditures of 10 percent of the total are used on four fifths of the commercial lands.

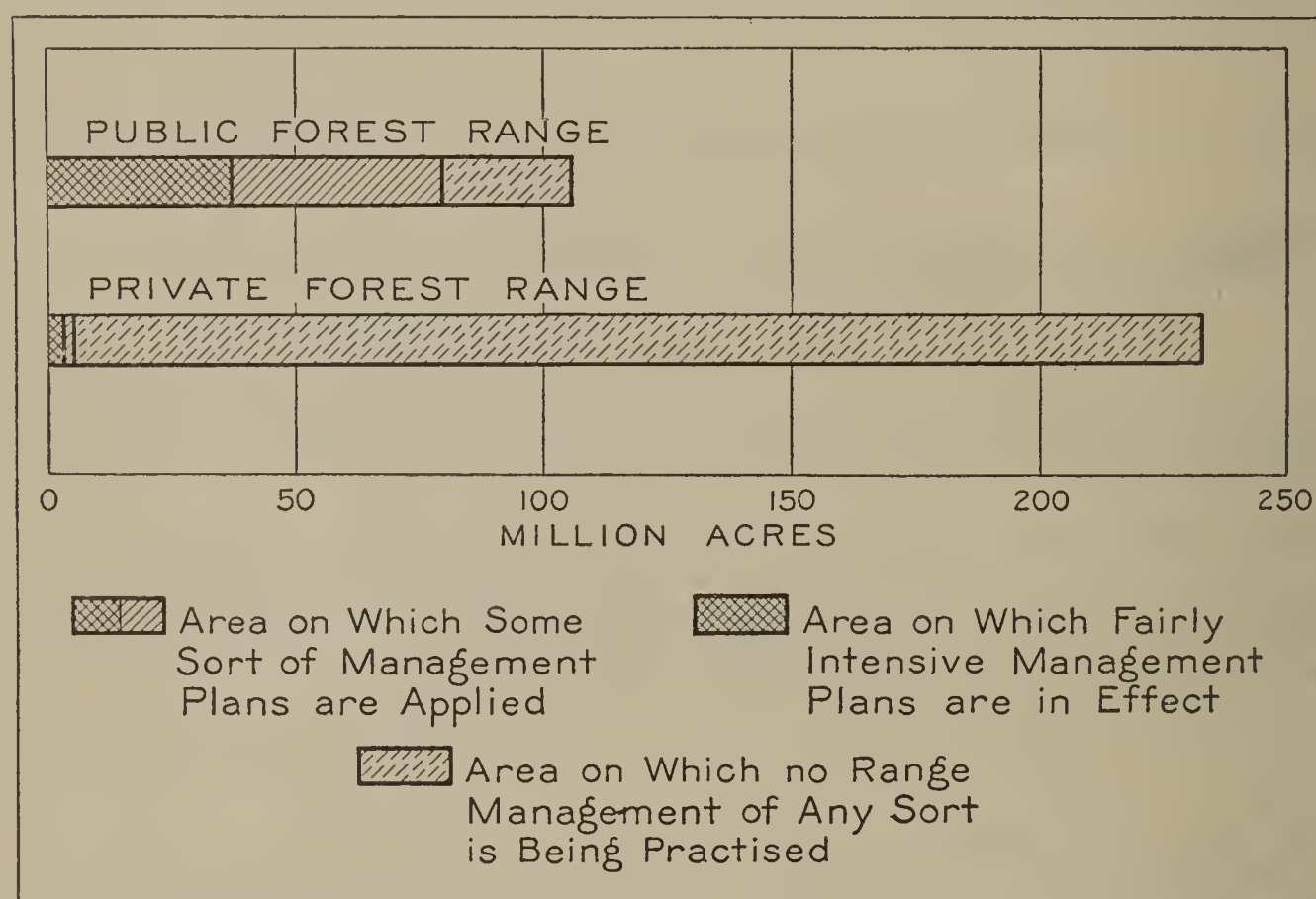


FIGURE 10.—Management of forest ranges. About two-thirds of the area is in private ownership, but public agencies have put a far larger area under management.

The extent to which private has fallen behind public ownership is summarized graphically on a percentage basis in figure 11. The distribution of expenditures is further shown in figure 12.

THE PROBLEM OF THE AGRICULTURAL LAND AVAILABLE FOR FORESTRY

A total of over 50 million acres east of the plains originally forested but not now included in the forest land classification is estimated by the Bureau of Agricultural Economics to have already been abandoned by agriculture and to be available for forestry.

It is made up of abandoned farms that have gone out of production, of idle or fallow land in farms still operated and of former pasture lands.

Abandonment is still in process. The Bureau of Agricultural Economics estimates that if present trends continue, approximately 15 million acres more may be abandoned by 1940, and from 25 to 30

by 1950. Further abandonment may be offset to a greater or less extent by increased needs for agriculture.

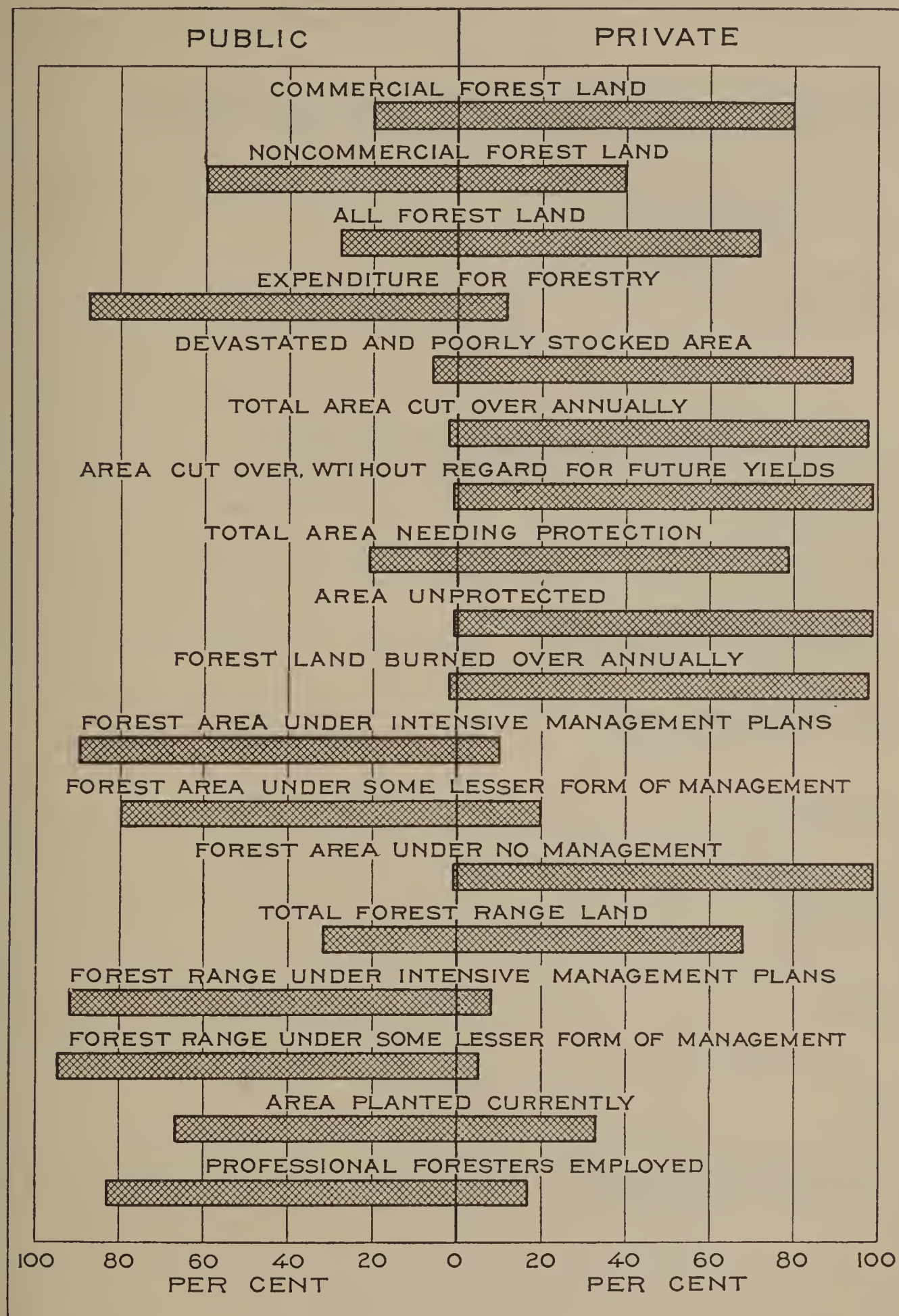


FIGURE 11.—Public and private ownership and forest activities. The public's share predominates in expenditures, in area under management, area planted, and in the number of trained foresters employed. The private owner's share stands out in area devastated, amount of the yearly cut without conscious regard for future stands, need of protection and lack of it, forest area burned, and absence of management plans on both timber and range lands.

The total area of agricultural land now available for forestry is, therefore, more than 50 million acres and may reach from 75 to 80 million acres by the middle of the century.

Abandonment seldom results from a single cause.

The physical character of the land, which may be so lacking in fertility, rough in topography, or stony, that agriculture is unprofit-

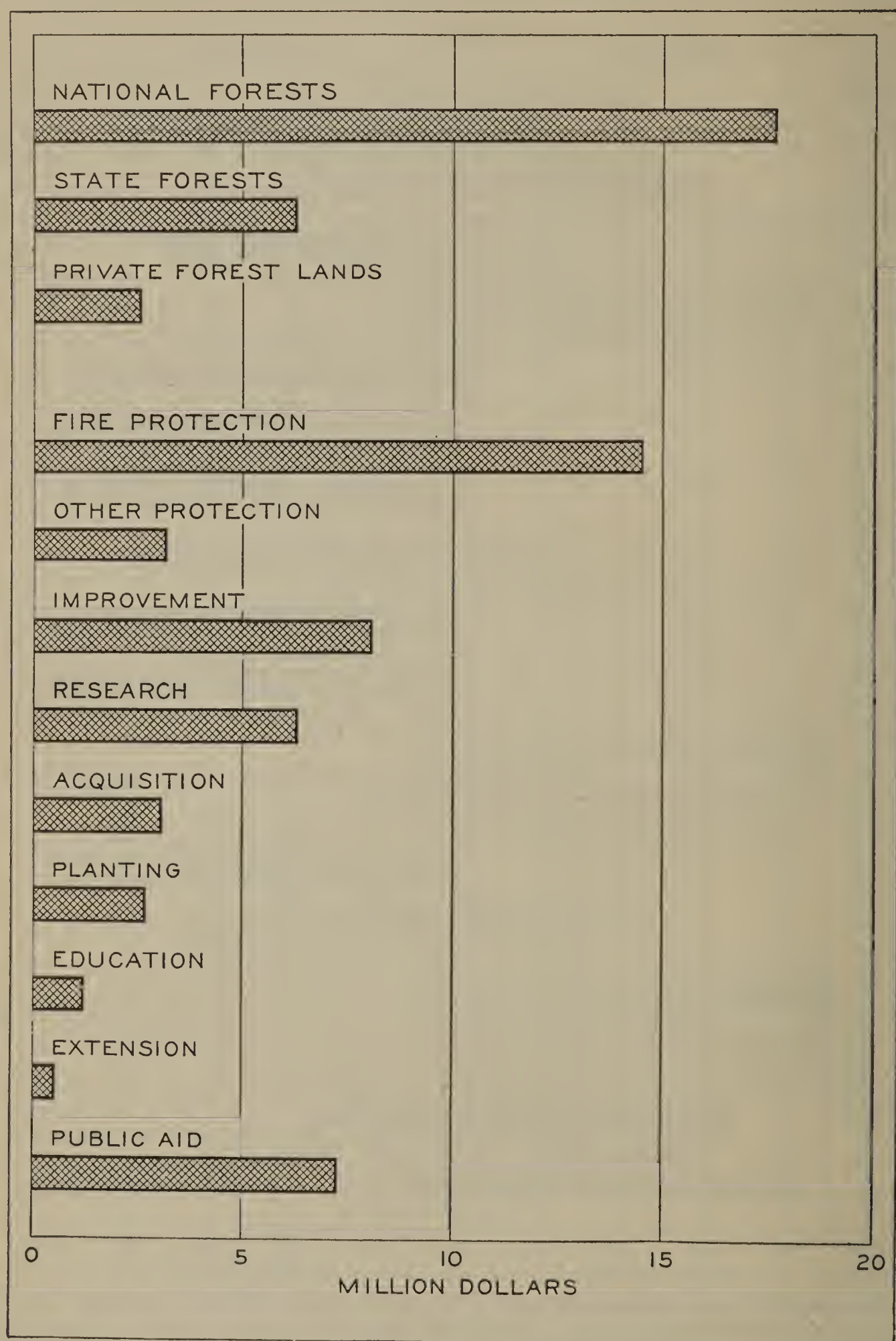


FIGURE 12.—Comparison of activity expenditures in forestry for 1932. The diagram throws additional light on the comparative efforts of different types of forest-land ownership. Even public aid to private owners is approximately three times the expenditures of private ownership on its own land.

able, is one cause. In many cases the original fertility has been depleted by erosion or repeated cropping.

Another group of causes are economic. Improved transportation has opened land west of the Alleghenies, first for cereal crops, cattle,

etc., and then with refrigeration for dairy products, fruit, and truck crops. Machinery adapted to use on level prairies has been developed. The opportunities in commerce and manufacture have attracted people to the cities. The loss of industries such as lumbering has led to loss of markets and to higher taxes.

These complex causes have accentuated each other and tended to make abandonment cumulative. The extent to which abandonment will lead to tax delinquency and involuntary public ownership cannot be forecast with any certainty.

The economic and social results are of the same order as those described under the private forest land problem and affect the entire economic and social structure of local communities and even of entire States. All of the unfortunate results react upon and aggravate each other, so that the country no less than the town has its slums and forgotten man.

Some of the most critical erosion and streamflow problems in the United States, as will be shown elsewhere, have resulted from the cultivation of land unsuited for agriculture. Such areas probably constitute a large part of the abandoned agricultural land class.

The abandoned agricultural lands are often of higher potential timber producing capacity than those now remaining as forest lands, but even the forest productivity has frequently been seriously reduced by erosion.

The abandonment of submarginal agricultural lands constitutes still another problem of private ownership of major importance.

THE PROBLEM OF UNMANAGED PUBLIC LANDS

THE FEDERAL PUBLIC DOMAIN

Not all of the major forest problems are those of private lands. The Federal Government has an unredeemed responsibility and an unsolved problem in the forested public domain of the Western States.

Although the public domain still includes nearly 175 million acres, it is but a remnant, not much more than one tenth of the original public domain, and naturally the area of lowest value from the private standpoint. Of this remnant about 23 million acres are forest land, including somewhat over 4½ million acres of commercial forest.

It receives at best only inadequate fire protection. It is given no timber management. Unrestricted private use of the range has reduced the forage cover over large areas to less than half its original density and on some areas to practically nothing. The valuable forage plants have suffered most. Under unrestricted private use it constitutes one of the most critical erosion and flood problems in the West.

No valid reason exists for delay in giving national forest status to the larger part of these lands and thus insuring the necessary management. The remainder should be placed under administration with the public domain.

An additional area of more than 2 million acres of revested Oregon and California Railroad and Coos Bay wagon-road grants is forest land. Management goes no farther than fire protection. The timber may be cut without any provision for restocking. Under existing law this land, after the timber is removed, is open to agricultural entry for which it is unsuited; if the timber stand is light, it is

open before cutting. Some form of permanent public administration is needed.

THE NEW PUBLIC DOMAIN OF THE STATES AND COUNTIES

The new public domain of the States and counties is growing rapidly from tax reverted forest land while the remaining public domain of the Federal Government is decreasing. The status of the new public domain is so uncertain that even its area is highly conjectural. Most of it is in a twilight zone between State, county, and private ownership.

In 29 States the title reverts to the counties or towns and in 19 to the State. The 25 million acre total for the Lake, Southern, and Northwestern States already referred to is only a part of what is already tax delinquent. The possibility that half of the forest land area in the Lake States will be in public ownership in 10 years is some indication of what is likely to happen to a greater or less extent elsewhere. The productivity of much of the tax-delinquent forest land has been wrecked by forest devastation so that private owners have no further interest in it.

In most States no effort has been made to define the status of this land by law or to attempt any administration beyond partial and inadequate fire protection. Only seven States have laws which even look toward classification and permanent administration. The indications are that some of these States will be overwhelmed with the problem. It is merely another instance where the development of political machinery has lagged seriously behind economic events.

This public-ownership problem has grown directly out of one phase of that of private ownership.

Sooner or later more or less of the abandoned submarginal agricultural land already discussed will probably also become tax delinquent. When and as it does, still another problem of private-land ownership will become an even more serious public problem. New York alone has made definite provision for solving it by setting up a 20-year program of acquisition and reforestation.

An additional area of State forest land of more or less uncertain status, and only in part under any form of management or protection, is the remnant of Federal land grants to the States. It totals several million acres.

Minnesota, Washington, and Montana alone have legally defined its status and made some provision for blocking it into State forests and placing it under management. In Idaho, Arizona, and New Mexico similar policies depend solely upon the decision of the State public-land administrative agency.

THE PROBLEM OF BALANCING THE NATIONAL TIMBER BUDGET

DRAIN AND REQUIREMENTS

The total drain from the forests of the United States is now about 16½ billion cubic feet.

Nearly 90 percent is cut and the remainder is the loss from fire and other causes. Of great significance is the fact that about 70 percent of the total drain, or the equivalent of about 59½ billion board feet, is from the large or saw-timber sizes. The largest single

item in the cut, about one half of the total, is for lumber, while fuel wood is nearly 30 percent.

The requirements of the future will be influenced by a large number of factors, the resultant of which cannot be predicted with certainty. It seems wise, however, to base plans for the future upon the best judgment that can be formed of probable normal requirements making reasonable allowance for losses that occurred during the predepression period and for factors that might affect future rates of consumption.

On this basis the conclusion has been reached that our forests should be put in the condition to meet an annual drain of at least $16\frac{1}{2}$ billion cubic feet for all purposes, including unpreventable losses from fire, insects, and diseases. A conspicuous part of these normal requirements so determined is 55 billion board feet of saw timber. This, for lumber, the most important product, would provide an annual cut of 32 billion board feet.

CURRENT AND NECESSARY GROWTH

Against current drain and probable normal requirements must, among other things, be balanced present and possible growth.

From the best data now possible to obtain, present growth is estimated to be about 9 billion cubic feet annually in timber of all sizes. The ratio of normal drain to growth is therefore nearly 2 to 1.

Growth of the all-important saw timber is somewhat less than 12 billion board feet. The ration of requirements to growth of this material is therefore about 5 to 1. The ratios for both classes of timber are shown in figure 13.

Of great importance also is the fact that drain and requirements for saw timber exceed current growth in varying ratios in every important forest region of the country, and with possibly one exception, for timber of all sizes.

The problem of balancing the timber budget is therefore in part, approximately to double the growth for timber of all sizes for the country as a whole, and in part also to increase that of saw-timber size by five times.

That this is within the realm of possibilities is shown by the fact that present growth averages per acre only 21 cubic feet, whereas in such a region as the South it ought to be possible to obtain 50 cubic feet by extensive forest management and 75 cubic feet by intensive forest management, both over large areas. Similarly in the Pacific coast region it should be possible to obtain growths of 45 cubic feet by extensive and 75 cubic feet by intensive forestry.

THE REMAINING TIMBER AND ITS AVAILABILITY

The virgin timber supply, which has always obscured the need for timber growing, is still a factor to be taken into account in balancing our national timber budget.

Four fifths of the all-important saw timber, of which we still have 1,668 billion board feet, is old growth. Four fifths of the saw timber and over nine tenths of the old growth is, however, in the West, while the large consuming markets are in the East and Middle West.

But availability is far more important than amount, and almost half the total is economically unavailable because of inaccessibility and other factors, on the basis of 1925-29 operating conditions and lumber prices. What the ultimately available amount will be depends upon such factors as demand, prices, changes in logging methods, and the competition of other materials.

Of timber of all sizes we still have left 487 billion cubic feet, 56 percent of which is in the West.

The problem of balancing our timber budget is complicated by the deficiency of the growing stock in all parts of the East, and par-

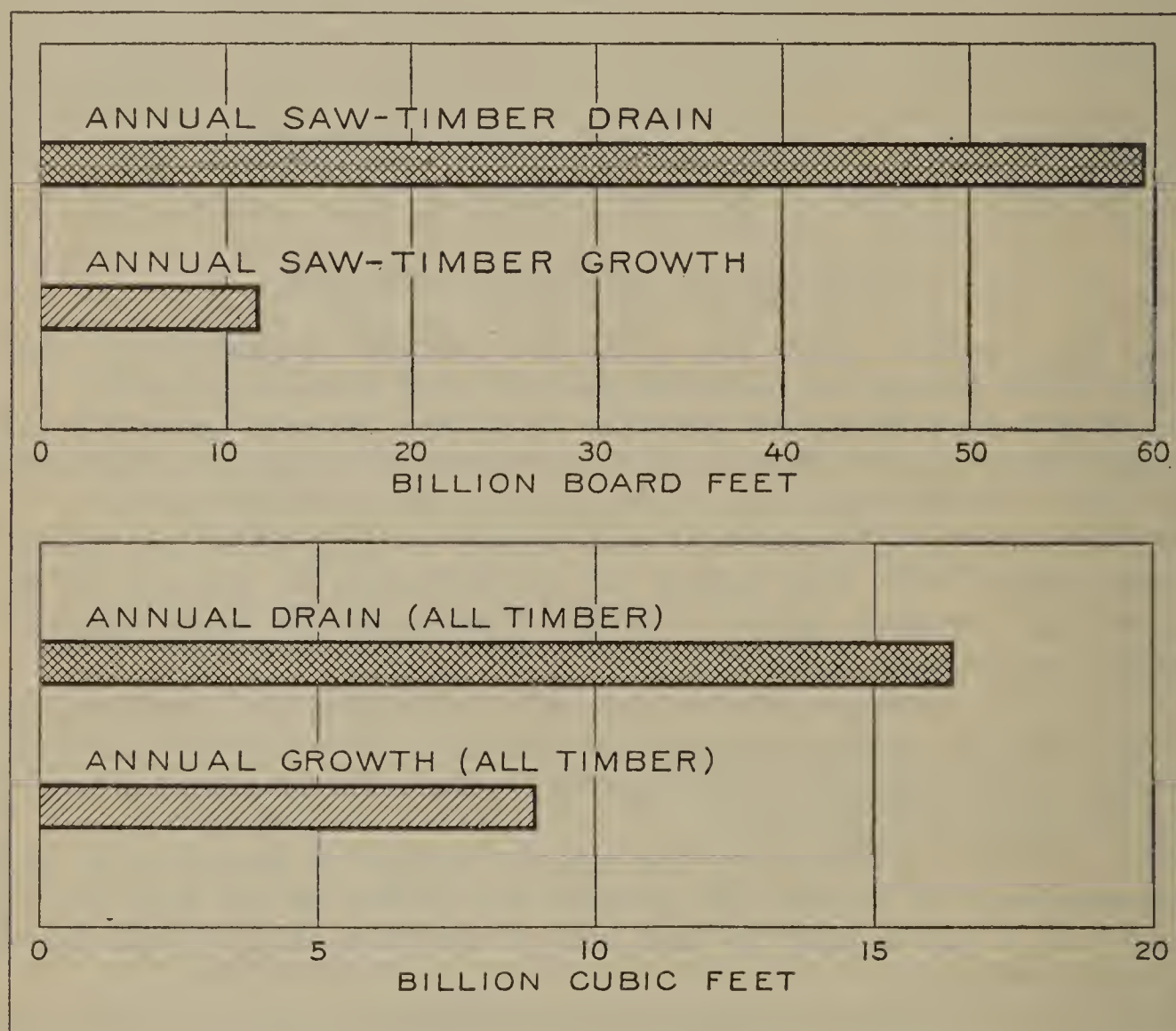


FIGURE 13.—The growing of the large saw-timber sizes is the critical factor in balancing the national timber budget. The saw-timber drain on our forests is 70 percent of the total drain and is about five times saw-timber growth.

ticularly in the South, which has by far the largest potential growing capacity of any region of the country.

MAKING UP THE DEFICIENCY IN GROWING STOCK

A regulated growing stock for the country as a whole, with saw timber equal to present volume, would make possible a sustained yield cut of only 46½ billion board feet, or with saw-timber volume equal to that having positive utilization value, only 26½. These amounts must be compared with a drain of 59½, and estimated normal requirements of 55.

The magnitude of the problem of increasing the forest capital in the entire East by the necessary two and one half times will be apparent when it is made clear that this must be done in the face of a 1925-29 drain which exceeds current growth by nearly 29

billion board feet for the all-important saw-timber sizes. This is shown graphically in figure 14.

PRIVATE OWNERSHIP THE LIMITING FACTOR

Private ownership is the limiting factor because it holds four fifths of the commercial forest land, with at least 90 percent and possibly more of the potential growing capacity (fig. 15). Under the present distribution of ownership nearly the entire deficiency of growing stock must be made up on private land, which it has as yet been the

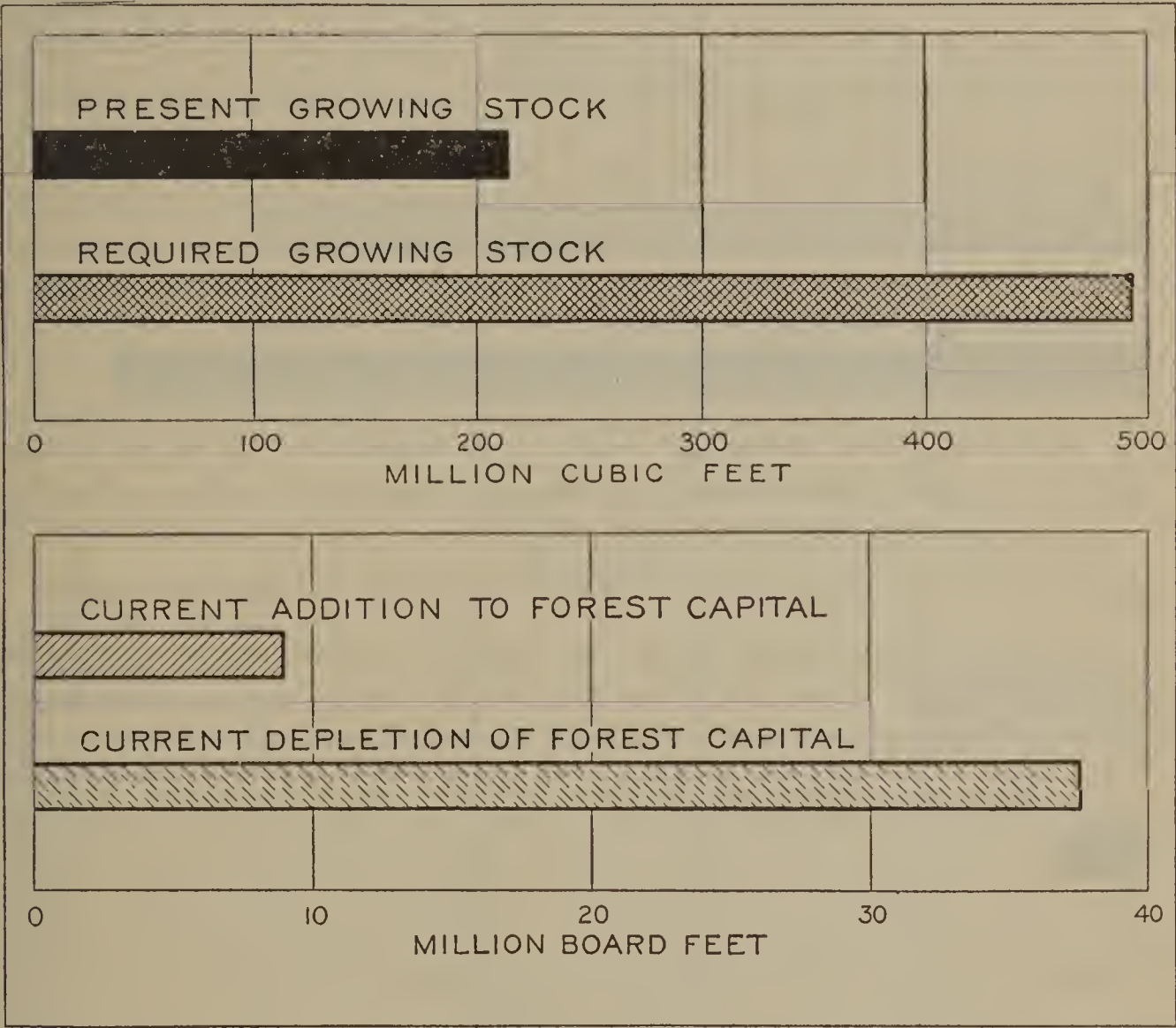


FIGURE 14.—Growing stock or forest capital in the East. The increase of the forest capital for the entire East by two and one half times is a prerequisite in raising growth to the level needed to meet national requirements. But the saw-timber portion of the growing stock is being reduced by some 29 billion board feet annually.

practically universal tendency of private practice to reduce rather than to build up.

THE PROBLEM OF WATERSHED PROTECTION

The service which the forest may render in watershed protection is probably as great in value as in the production of wood, and may be greater.

The possibility of protective service ranges from great river systems like the Mississippi to the “dry” washes of a few acres in the semiarid West. It is not confined to the headwaters but may be most acute on the very bluffs of great streams like the Mississippi.

THE IMPORTANT PHASES OF THE PROBLEM

The main urban centers of the east coast from Boston to Baltimore consume more than 2 billion gallons of water daily. Large cities are bringing their water supplies from distances of 60, 92, 200, 250, 450 miles at costs, actual or proposed, ranging upward to \$350,000,000 for a single project.

Extreme droughts such as that of 1930-31 show the acuteness of the domestic water supply problem even in the humid East. In southern California if not elsewhere the availability of water definitely

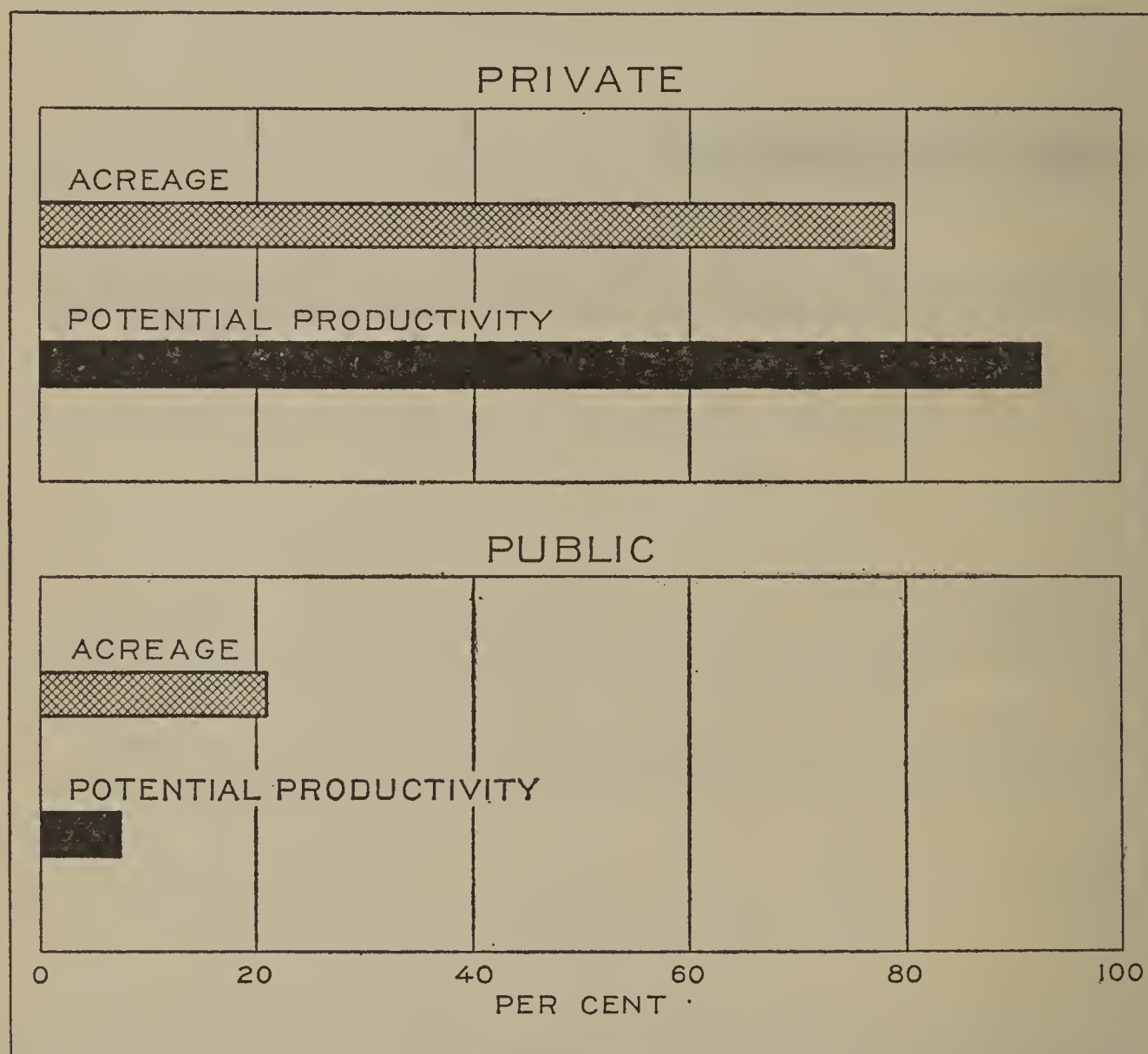


FIGURE 15.—Private ownership dominates the possibility of timber production in the United States, with four fifths of the commercial forest land and nine tenths or more of the potential timber growing capacity.

limits the size of the population. All cities must have abundant, continuous supplies of good water.

Nineteen Western States now have reservoir and distributing systems for irrigation, valued at more than \$1,000,000,000, to supply about 19½ million acres of irrigated land which with its buildings and machinery is valued at over \$4,000,000,000. Far-western agriculture is largely that of irrigated lands. The amount and the time at which water is available are limiting factors, since there is much more land than water.

Water is one of the great sources of power in the United States and, unlike coal and oil, it is not exhaustible. In 1931, 26 States had developed more than 100,000 horsepower each from their streams, ranging downward from 2,321,000 in California to 135,000 in Virginia.

Regular stream flow, freedom from silt that will fill reservoirs are important factors in all water power development and use.

The importance of watershed protection is indicated by the fact that the Federal Government has been willing during the past 50 years to expend for the improvement of our rivers and harbors in excess of \$2,000,000,000. Again regularity of flow and freedom from silt are vital factors in the availability, use, and cost of maintenance.

Floods occur in every part of the United States and damages range downward from the great Mississippi disaster of 1927, estimated at 246 lives and \$300,000,000, to those caused by local floods so small as to escape notice. Every year has its quota.

Expenditures for major engineering works for flood control have run into the hundreds of millions of dollars, but the problem is far from solution. There is ample reason to believe that fully satisfactory control must utilize all means at our disposal, including the forest.

Excessive erosion, either spectacular or so inconspicuous as to go unnoticed, is common to nearly all parts of the United States. It occurs on agricultural, range, and forest land. It loads streams with silt, clogs irrigation works, navigable channels and harbors, fills reservoirs, increases the height of floods, and adds enormously to their destructive power.

Because it first removes the fertile top layers of soil it is a primary cause of land abandonment. It is undoubtedly the most destructive agency affecting our greatest basic resource, the soil.

THE RELATION OF THE FOREST TO WATERSHED PROTECTION

General observational studies in the United States have substantiated both the popular conception and European experience that the destruction of the forest cover leads to erosion and that the presence of such cover is the most effective means for erosion control.

Furthermore, they have shown that the forest will rebuild the soil.

Intensive research makes the relationship between forest cover and erosion still more conclusive. Results in different parts of the country on different soils with varying precipitation, etc., show that the ratio of erosion between barren forest land and that with forest cover may vary all the way from 15, 1,000, and 3,920 to 1.

It has been estimated that 1,000 years may be necessary to build up an inch of soil, an amount which often is removed by erosion in 1 year.

Observational studies have shown that destruction or deterioration of the forests is one of the major contributing causes of excessively rapid run-off and destructive floods, and that the presence of the forest retards the rate of run-off, puts the water into the soil and underground channels, reduces the height of floods, increases summer flow, and delivers water free from sediment.

Intensive research shows that the ratio of run-off between denuded and forest-covered soils varies from 3, 110, and 187 to 1, with intermediate ratios for partially destroyed forest.

Among the chief causes of forest destruction in relation to water protection are fire, logging, overgrazing, and smelter fumes. The most critical watershed conditions in the United States have, however, resulted from clearing for agriculture.

The best classification possible with the data available indicates (fig. 16) that 308 million acres or half of the forest area of the United

States exerts a major influence on watershed protection and that an additional one fifth exerts a moderate influence.

THE MOST CRITICAL CONDITIONS

The most critical watershed conditions resulting from the clearing of land for agriculture are the Mississippi bluff and silt-loam uplands, the piedmont and upper coastal plain in the Atlantic and Gulf drainages, and the Central State farm lands of the Mississippi Basin.

The bluff and silt-loam upland area, approximating 20 million acres, extends from New Orleans to St. Paul. Its wind-blown silt-loam soils contribute more to the Mississippi silt problem than any other area of equal size. A high percentage of the area, in some cases 40 percent of entire counties, is being rapidly destroyed for agriculture by erosion. It is an enormous contributor to the serious Yazoo flood problem, where experimental tests have shown a run-off ratio between cultivated fields and forest of 127 to 1.

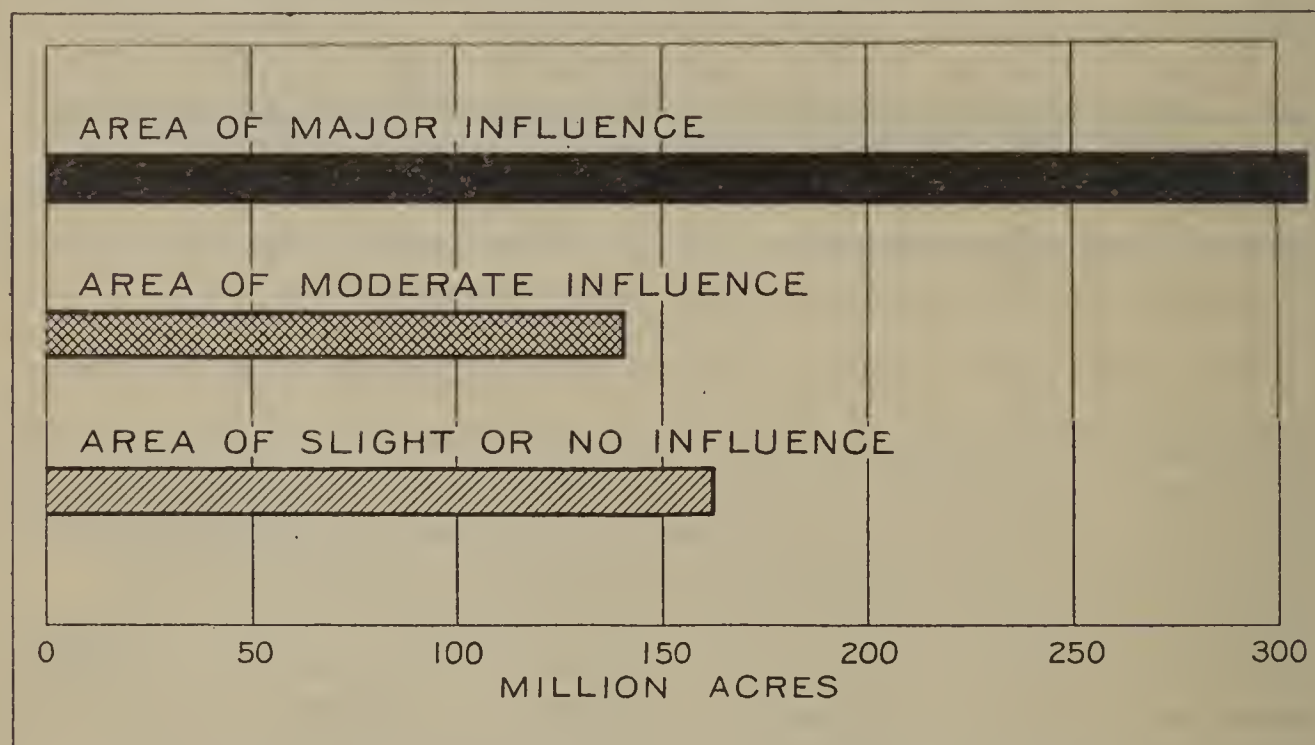


FIGURE 16.—One half of the total area of forest land of 615 million acres is classified as having a major watershed influence and nearly three fourths as having a major or moderate influence. This indicates only in part, however, the value of the forest for watershed protection.

Erosion and floods are hardly less serious on the much larger piedmont and upper coastal plain extending from the Potomac into Mississippi. Largely as a result of erosion, at least $8\frac{1}{2}$ million acres have been abandoned for agriculture in the past 20 years and trends indicate a total of 12 million by 1950.

The Central States farm land area, including parts of 10 States from West Virginia and Ohio to eastern Kansas and Nebraska, makes another large contribution to the Mississippi River flood and silt problem. The abandonment of 15 million acres of farm lands in the area of most critical erosion conditions seems to be only the beginning.

The watersheds of the northeastern drainages derive their chief watershed importance as the source of the municipal supplies of the great Eastern cities from Boston to Baltimore. The forests most in need of improvement are in the southern half of the area.

The Appalachian Mountain ranges feed the Mississippi and its tributaries, and the Atlantic coast and Gulf rivers from the Delaware to the mouth of the Mississippi. Heavy and frequently torrential

precipitation, easily eroded soils, the clearing of steep slopes for agriculture, and deteriorated forests accentuate the watershed problem.

The Ouachita-Ozark Mountain area of Arkansas, Oklahoma, and Missouri make up only 5 percent of the Mississippi River drainage, but have contributed from 25 to 50 percent of the peak flow of the lower-river floods. No other area of equal size is as great a factor in flood height. Hillside agriculture, cutting without provision for the future of the forest, fires that burn one seventh of the area annually have markedly reduced the possible watershed protection.

The Breaks of the Arkansas and Red Rivers and the Badlands of the Missouri contribute a volume of sediment to the Mississippi far in excess of the proper proportion of a total area of only 20 million acres. The cutting of the sparse tree growth and excessive grazing are partly responsible.

Only an exceptionally luxuriant vegetative cover saves the Pacific coast dense forest region with its heavy precipitation from being an extremely critical watershed problem.

The ponderosa-lodgepole pine belt forests are the source of two thirds of the irrigation water of the West, of one third of the 14 million installed horsepower capacity of the country, and of municipal supplies for 6 million people. Destructive cutting, fire, and unregulated grazing have reduced the effectiveness of the cover over large areas.

Eighty million acres of semiarid woodland and brush lands constitute the most critical western erosion and flood problem on forest lands. Depletion of the normally sparse vegetative cover chiefly by destructive grazing and fire have seriously impaired its protective values.

THE RELATION OF OWNERSHIP AND MANAGEMENT TO CRITICAL PROBLEMS

Private land ownership is the key to the watershed problem on eastern agricultural lands, to practically all of the forest-land problem of the East, and also to the ponderosa-lodgepole pine problem of the West.

The unmanaged public domain, which includes over 23 percent of the semiarid woodland and brush lands, constitutes the most critical erosion and flood problem on western forest lands.

THE PROBLEM OF FOREST RECREATION

Recreation in this report means anything done directly for the pleasure or enrichment which it brings to life, in contrast to things done primarily to obtain the necessities.

People who visit the forest for recreation have a great variety of purposes. It may be the desire for play, the preservation of health, the pursuit of beauty, communion with nature, favorable environment for contemplation, scientific knowledge, adventure, or to escape from civilization. While few go to the forest for all of these purposes, each one influences at the very least tens of thousands of people.

The best available figures on current annual volume indicate about 250 million man-days spent in recreational use of the forest and an expenditure by forest recreationalists of not less than \$1,750,000,000.

Recreational use jumped from about 300,000 to 3 million visitors in national parks and from 3 million to 32 million visitors in national forests between 1917 and 1931.

There is good reason to anticipate a great increase in the future. The factors which will cause this growth include an increasing population, shorter working hours, a probable rising standard of living, the increasing ease of transportation, and the increasing necessity, as society becomes more and more mechanized, for some possibility of escape to the primitive.

The use of the forest for recreation seems therefore to be in its infancy. We probably as yet have only a limited conception of the ultimate possibilities and needs for this social service in a highly industrialized nation.

Practically all forest land which has not been severely damaged by fire and logging has some recreational value. Sustained yield timber growing will preserve much of the attraction for recreationalists. Since even the best silvicultural practice does not conserve all recreational values, it is necessary to set aside a limited area exclusively for recreation.

One phase of the problem is to anticipate the full range and volume of needs and possibilities.

Another is to decide what kind of forest areas are needed, whether superlative, primeval, wilderness, roadside, camp site, residence, outing, or others; how many of each there should be, how large, and how they should be distributed.

Still another phase is that of ownership. Forest devastation or deterioration for immediate income, which has characterized private ownership, does not conserve recreational values. A further question is whether permanent preservation can be insured except in public ownership. It may be questionable whether lands in private ownership will be open to permanent use by the general public.

THE PROBLEM OF FOREST WILD LIFE

THE DEPENDENCE OF WILD LIFE ON THE FOREST

The forests of the United States provide all or part of the habitat for a large percentage of our remaining wild life, important for food, fur, and hunting, or for esthetic purposes.

The streams and lakes dependent upon forest land also constitute the most favorable habitat of many valuable game fishes and the temporary habitat during early life of some of the important commercial anadromous fishes such as salmon and shad.

ECONOMIC AND SOCIAL VALUES

The Senate Committee on Conservation of Wild Life Resources places the total hunters and fishermen in the United States in 1929 at 13 millions, and estimates that this is a 400 percent increase in a decade. The number promises to increase along with the increase of outdoor recreation which will come with increased leisure and facilities for travel.

The direct values of wild life include the sale of hunting licenses, the value of meat and fur, the sale of hunting and fishing equipment,

expenditures of sportsmen, and the value, chiefly of birds, as destroyers of insects. The Biological Survey estimates the total positive national value of wild life at over \$1,000,000,000 annually.

The commercial fisheries of the Mississippi and its tributaries in 1930 produced values of \$4,385,000. For the year ending June 30, 1932, approximately 4,850,000 State licenses carried the angling privilege. The value of fishing tackle sold annually was estimated in 1929 by a trade association at \$25,000,000.

THE DEPLETION OF WILD LIFE

In general wild life has decreased and is still decreasing on much of the forest land of the country. Some species have been almost exterminated. This is also true of fish. Many waters which were well stocked only a few years ago are now seriously depleted.

The reasons are the far greater number of hunters and fishermen, the lack of adequate control, disease, and the deterioration or destruction by fire or otherwise of forest cover and other essential conditions of habitat. The floods and erosion which commonly follow forest destruction or deterioration are an important cause of the scarcity of fish.

THE POTENTIALITIES OF WILD LIFE UNDER MANAGEMENT

The numbers of game animals on the national forests are estimated to have increased 40 percent between 1926 and 1931 as a result of management. Certain species, such as deer, are unquestionably increasing appreciably over considerable areas in many parts of the country and under favorable conditions, including the regulation of hunting.

In general the wild-life population of the forest is far below what it might be. One of the important problems is to work out forms of management on the principle of sustained yield, which involves proper stocking, the furnishing of food and cover requirements, protection from natural enemies and other injurious factors, and the removal of surplus only.

One of the most important aspects of management for land forms of wild life is that of coordination with timber production and utilization, and the grazing of domestic livestock.

Special aspects of the problem of building up numbers of fish include their introduction into waters in which they are not native, artificial propagation and stocking, protection from overfishing, and the improvement of streams and lakes to provide more favorable conditions. The beneficial effects of forestation on the latter phase can scarcely be overestimated.

One of the complications in wild-life management is that of separate land ownership and wild-life control except where the land is owned by the States. Land ownership may be either private, State, or Federal while wild-life control rests in the State. This phase of the problem involves both wild-life regulation and the possibilities of returns to the private owner. Similar complications exist in the case of fish.

THE NEED FOR PUBLIC HUNTING AND FISHING GROUNDS

Nearly 450 million acres of our forest land is in private ownership, which means that the only assured areas which remain for public hunting are the publicly owned lands.

Although less emphatic than in the case of game, the present tendency is toward the exclusion of the public from the more desirable angling waters within private lands. This creates the same need for public-fishing grounds.

The area of public lands is much the largest in the West because of the existence of the national forests. In the East, the national forests make up only 2 percent of the total area of forest lands. State forests and parks are less than 3 percent.

THE PROBLEM OF FOREST RANGES

Grazing use of 334 million acres, or more than half of the total of 615 million acres of forest land, shows that the forage constitutes one of the important products of the forest.

The large areas which can be so utilized under proper management will increase the returns to the owner, contribute to the economic and social welfare of local communities, and furnish in part the raw resource for the livestock industry.

THE WESTERN PROBLEM

The largest and most critical western forest range problem is that on 42 million acres of privately owned lands.

In an effort to obtain the maximum immediate financial returns, grazing has been so heavy that over large areas the forage resource has been reduced to less than half its original density. This has reduced watershed protection still more and in some instances prevented full timber reproduction and growth. The effects on the livestock industry and economic and social community development and welfare differ only in degree from those of forest devastation and deterioration.

The problem of the forest ranges of the unmanaged Federal public domain is equally critical on a smaller area, approximately 21½ million acres. Unrestricted private use of this range has resulted in forage, watershed, forest, economic, and social conditions similar to those indicated in the preceding paragraph.

On about 4 million acres of State forest ranges grazing privileges have ordinarily been leased without supervision of use. Results differ but little from those on privately owned lands and the Federal public domain.

The problem on the 64 million acres of forest ranges in the national forests and the 12 million on Indian reservations is a fuller correlation with timber production and watershed protection and the improvement of the range resource itself now under way but not yet fully completed.

THE EASTERN PROBLEM

The eastern forest range problem is almost entirely one of private ownership.

That of the southern ranges is largely unrestricted use, often by others than the owner of the land, and the uncontrolled use of fire.

That of the farm woodlands, mainly of the Central States, is a decision between range use, the main benefit of which is the shade that could be obtained from a much smaller area, and timber growing which is impossible with heavy range use.

THE PROBLEM OF KNOWLEDGE

THE FORESTRY MOVEMENT HANDICAPPED BY LACK OF KNOWLEDGE

Lack of knowledge of the inevitable consequences has been one among the many factors responsible for the public policy of allowing excessive areas of forest land to go into private ownership.

It has been partly responsible also for allowing large areas of land to go into agriculture which were submarginal for that purpose and which should have been kept in forest.

Still further, it has been partly responsible for the delay in putting under administration forest land remaining in the Federal public domain and for the delay by the States in recognizing and providing for the still larger area which by reversion to public ownership via the tax delinquency route is becoming a new public domain.

Lack of knowledge has been one of the factors which has led private owners to adopt the cut-out-and-get-out policy. This in turn led to oversized plants, far too short depreciation periods, excessive capital costs, the cutting of unprofitable timber, lack of provision for future crops, and the devastation or deterioration of a large part of the privately owned commercial forest land.

The manufacturers of wood and particularly of lumber have rested content with rule-of-thumb methods based on centuries of use. The inevitable result has been that new or greatly improved old materials fighting for markets have, by the adoption of modern competitive methods such as research, displaced wood and especially lumber in large volume.

In present-day competition no material, regardless of its intrinsic merit, can expect to hold its own without scientific knowledge of its properties and how to modify them to meet increasingly exacting requirements.

Reliance on rule-of-thumb practice in the utilization of forest ranges has led to the serious deterioration of practically the entire range area for forage production and of some areas for timber production.

The combination of forest devastation and deterioration through unwise cutting and uncontrolled fire, excessive grazing of forest ranges, and the clearing and use of submarginal lands for agriculture, singly or in combination, has created critical watershed conditions in nearly every part of the United States. In all of this the lack of knowledge of the inevitable outcome has unquestionably been one factor.

On both public and private lands efforts to grow timber have started without traditional knowledge such as had been slowly built up by large-scale trial and error in agriculture. European forestry was remote and utilized different species under radically different climatic, economic, and social conditions. Lack of knowledge inevitably led to mistakes, which because of the time required to grow timber crops have been very costly.

It has been and still is a decided factor in the long, slow, uphill fight to get on top of our fire problem. It has led to the ineffective expenditures of large sums of money, great loss in timber and area burned, and still greater loss in reduced productivity of land.

It has delayed the natural reforestation of cut-over forests. In planting it has led to costly mistakes and delays.

It has brought to the forest wild-life problem only a belated recognition that protection alone has created serious problems which only sustained yield management fully correlated with other forms of forest use can solve.

It still leaves us uncertain regarding the best methods of controlling our most common forms of insect infestation. It has attempted by quarantines to close the door to further importations only after the introduction of such diseases as the chestnut blight, which is practically wiping out one of our most valuable hardwoods, and such insects as the gypsy moth, which has already necessitated expenditures of millions of dollars and is still on our hands.

Lack of even traditional knowledge has almost certainly been a factor, particularly for the private owner, in discouraging any attempt to practice forestry.

It has slowed down progress, impaired efficiency, and increased costs. In these ways, and perhaps still more by not anticipating the great losses caused by erroneous public and private policy and practices, it has been partly responsible for great public and private losses and is still handicapping progress of the entire forestry movement.

RESEARCH DEVELOPMENT BELATED AND INADEQUATE

In typical American fashion the development of research has ordinarily lagged far behind executive action.

The aggressive expansion of research was 15 years behind pronounced national-forest development. Large-scale fire protection and planting long anticipated research to ascertain the best technique.

Repeated attempts to formulate national, regional, State, and industrial policies preceded efforts to obtain authoritatively the facts on which they should be based.

The lumber and other forest industries lost large markets to competitors before beginning efforts to obtain accurate knowledge of their product. By far the largest investigative effort in the forest industries still concerns itself largely with tests to insure a uniform product.

Whole forest regions are still without forest experiment stations worthy of the name. In many important types practically no research has yet been done. A complete and authoritative survey of the forest resources of the United States has never been made. Examples of what we do not know and have not yet attempted to learn, or attempted only inadequately, could be expanded indefinitely.

The aggressive development of forest research has occurred almost entirely since the war, and most of it is far too recent to have produced any but preliminary results. Even the training of men for the work has been largely a post-war development.

EXTENSION NOT EVEN COMMENSURATE WITH RESEARCH

Advice on the ground to the private owner of forest land on how to grow timber is the most poorly organized and financed public activity in American forestry. It is least effective in reaching the industrial owner, who holds more than half of our commercial forest land. The failure of public agencies is not being made up by any others.

The best organized and best financed extension effort is that dealing with farm wood lots. While expenditures reach about \$160,000 and work is under way in 33 States, it reached in 1931, to the point of effecting some improvement, only about 1 owner in 100.

Federal extension for industrial timberland owners is an incidental effort by employees whose main responsibility is national-forest administration or research. That in the better utilization of forest products is confined largely to the Forest Products Laboratory, a research institution.

State extension to industrial owners is fairly well organized in only a few States, and expenditures are very small.

Other efforts at extension include a number of associations, most of which work through the press, and a relatively small group of consulting foresters who are very active and effective in reaching private forest landowners on the ground.

WHY THE SOLUTION OF THE MAJOR FOREST PROBLEMS CONSTITUTES ONE OF OUR MAJOR NATIONAL PROBLEMS

The full national significance of the solution of these interrelated major forest problems can be evaluated only by considering them in the aggregate.

SOLUTION THE ONLY MEANS FOR UTILIZING FOREST AND ABANDONED AGRICULTURAL LAND

The only uses in sight for our forest and abandoned agricultural land are for forestry or for farm crops and pasture.

But the demand of agriculture for land is contracting and not expanding. The abandonment of more than 50 million acres of crop and pasture land during the last 2 decades, and the possibility of the abandonment of 25 to 30 million acres more before 1950, is sufficiently conclusive proof of trends.

Beyond this, repeated attempts made to utilize forest land for agriculture over millions of acres in the Lake States, South, and West have ended in failure. Waves of settlers have been put on the lands by timberland owners and by real-estate promoters. The agricultural colleges and experiment stations have devoted years of research and other effort to develop the possibility of agricultural use. All of these efforts have ended in failure except on the best agricultural land.

SOLUTION THE ONLY OR THE BEST MEANS FOR SUPPLYING WOOD AND OTHER RENEWABLE RESOURCES

Despite a falling off of per-capita requirements following the pioneer period, wood promises to keep a permanently important position among our materials. It has high intrinsic value, is easily worked, is

relatively cheap, and can in natural and modified forms be used for innumerable purposes. It has the great advantage of being renewable.

Regardless of other considerations, it is in the public interest that it be kept in competition with other products.

Even though it were available from other countries, the advantage of having it at home and near the point of use is very great. But looking to the future and considering conifers for chief use, the hope of obtaining adequate supplies by imports is small. The world in general, like the United States, is overcutting its coniferous forests. World growth, may not be more than two thirds of the drain, and consumption is increasing or at least holding its own.

Under many conditions the forest probably offers the best and cheapest method available for erosion control and stream-flow regulation. On scores of millions of acres the returns for this purpose alone would probably justify the expenditures required for keeping a forest.

The restoration of the forest may also be the cheapest and best means for rebuilding impoverished soils on millions of acres against possible future need for agriculture.

The forest is already one of the great sources of recreation. By taking advantage of improving transportation facilities it can be made to aid materially in solving the problem of how to use the rapidly increasing leisure of all classes of people.

Forest land is the natural and in many instances the only remaining habitat of many forms of wild life, and the same is true of forest waters for fish. Public hunting and fishing grounds are being more and more closely confined to the public forests. Both economic and social values are involved.

Forest ranges can be made to support many millions of domestic livestock for at least a part of the year.

SOLUTION THE ONLY MEANS FOR THE PERPETUATION AND STABILITY OF FOREST INDUSTRIES AND FOR THE FULL DEVELOPMENT OF RELATED INDUSTRIES

The forest industries depend either on the virgin timber resource or new crops. Their present place in our industrial structure is indicated by a predepression capital value including forests estimated at \$10,000,000,000 and gross products prior to 1929 averaging close to \$2,000,000,000. Ultimate dependence on new crops has been masked over 3 centuries by virgin timber supplies, but the end of these supplies is now definitely in sight. New timber crops will then become the sole means of support for these industries.

Hardly less dependent for full development are the industries based on water derived from forest lands, on forest ranges, forest wild life, and forest recreation.

Many local industries and innumerable small business enterprises are in turn directly dependent on the forest industries. The forests and forest industries are important adjuncts to agriculture, which could hardly exist in many regions without them.

The benefits of stability and permanence in communities, in government, and in social institutions are too obvious to require comment. These can be assured in full measure in forest regions only if the forest and related industries make their proportional contribution.

SOLUTION AN IMPORTANT SOURCE FOR EMPLOYMENT OF LABOR

The development of labor-saving machinery is making means for the profitable employment of labor a critical national necessity.

In 1929 forest work, including logging and wood manufacture, afforded full-time employment or its equivalent to 1,500,000 people. Fully productive forests, at the rate of 1 employee to 250 acres, a conservative estimate in the light of both European and American experience, could employ 2 million people. This does not include the merchandising of forest products and services to forest-products industries. Neither does it include industries dependent upon forest water, forest ranges, forest wild life and recreation, and minor products and services. For all of these a large additional number could be added.

On the public forests alone there is undoubtedly the opportunity for the emergency employment of a very large number of men. Private forests could probably accommodate several times as many.

In fully managed forests, which we cannot have for many years, the opportunity for depression employment would be lessened. The manufacturers of forest products suffer during depressions along with other industries, but the possibility of woods employment might serve to absorb any surplus and prevent the aggravation of unemployment.

SOLUTION OFFERS ONE IMPORTANT AID IN PUBLIC FINANCE

Productive forests widen the tax base. This includes privately owned forests, sawmill, pulp and paper, and other manufacturing plants, the property of industries using other forest products, the property of service industries, and the homes and other property of people engaged in all these industries. The pulp and paper plants in Wisconsin are valued at around \$100,000,000 and could be supplied in perpetuity by 2 million acres of well-managed forests.

An enlarged tax base reduces the per dollar of tax base cost of public functions such as local governments, schools, highways, etc. It makes it possible to raise the standards of these functions. It lessens the need for State aid. Almost every county in the cut-over region of Michigan now receives, for example, more money than it pays in taxes.

Even public forests pay a direct financial revenue to local government, which supplements a wider tax base for other property. The national forests return to State and local governments 25 percent of gross receipts. The States pay varying amounts usually on a per acre per annum basis.

The Federal Government itself obtains revenue from the forest and related industries through the income tax.

SOLUTION ONE IMPORTANT MEANS FOR MAINTAINING A BALANCED RURAL ECONOMIC AND SOCIAL STRUCTURE

The solution of the major forest problems offers a means for the utilization of the land for forests which cannot be used for any other purpose, including agriculture. Such utilization should therefore serve as the basis for stable permanent local industries dependent upon the products of both forest and agricultural land.

It should serve as a sound basis for a balanced economic and social structure, which would help to retain in the country a reasonable proportion of the population and help to offset the long-continued movement from the country to the cities. Such a combined forest and agricultural economy should be as nearly depression-proof as any now known.

SOLUTION ONE MEANS TO NATIONAL WELL-BEING AND TO INTERNATIONAL COMPETITION

The economic and social development which is most highly advantageous for many local regions should prove equally so for the country as a whole.

Abundance of raw resources, including land and timber, has been one of the chief factors in the phenomenal growth of the United States. Their continued availability should be of equal or even more value in the future.

Many tendencies indicate for the future an increasingly severe competition between nations in manufactured products. A great advantage should lie with the nations having excess supplies of valuable raw products, like wood which other nations need and cannot grow. The distinct probability that there will be such a need for coniferous woods particularly has already been pointed out.

What is true of national needs and of international competition in peace is much more vitally true in time of war.

SOLUTION NOT ONLY JUSTIFIED BUT IS ONE OF MAJOR NATIONAL PROBLEMS

The 670 million acres of forest and abandoned agricultural land now available for forestry is more than one third of the total land area of the United States. As shown in figure 17, it exceeds by 120 million acres the entire area east of the Mississippi. It is more than half again as large as the area now devoted to farm crops (fig. 18). It exceeds the combined areas of France, Germany, Norway, Sweden, Spain, and Italy (fig. 19).

When to possible benefits of utilizing this vast area of land are added those of maintaining great forest and other industries in perpetuity, of employment for a large number of laborers, of a balanced rural and social economy, of the advantages of national well-being, and of a favorable position for international competition, the forest problem justifies a rating well in the forefront of our great national problems.

The effort which should be made on the forest problem should be rated along with those past, present, or proposed on the Panama Canal, which to date has cost more than \$500,000,000; the Hoover Dam, for which \$165,000,000 has been authorized; the river and harbor improvements, for which nearly \$2,000,000,000 has been expended by the Federal Government alone; the proposed St. Lawrence waterway, the cost of which is estimated at \$252,000,000; and even the public highway system, the annual expenditures for which rose from \$1,000,000,000 in 1921 to \$2,000,000,000 in 1930.

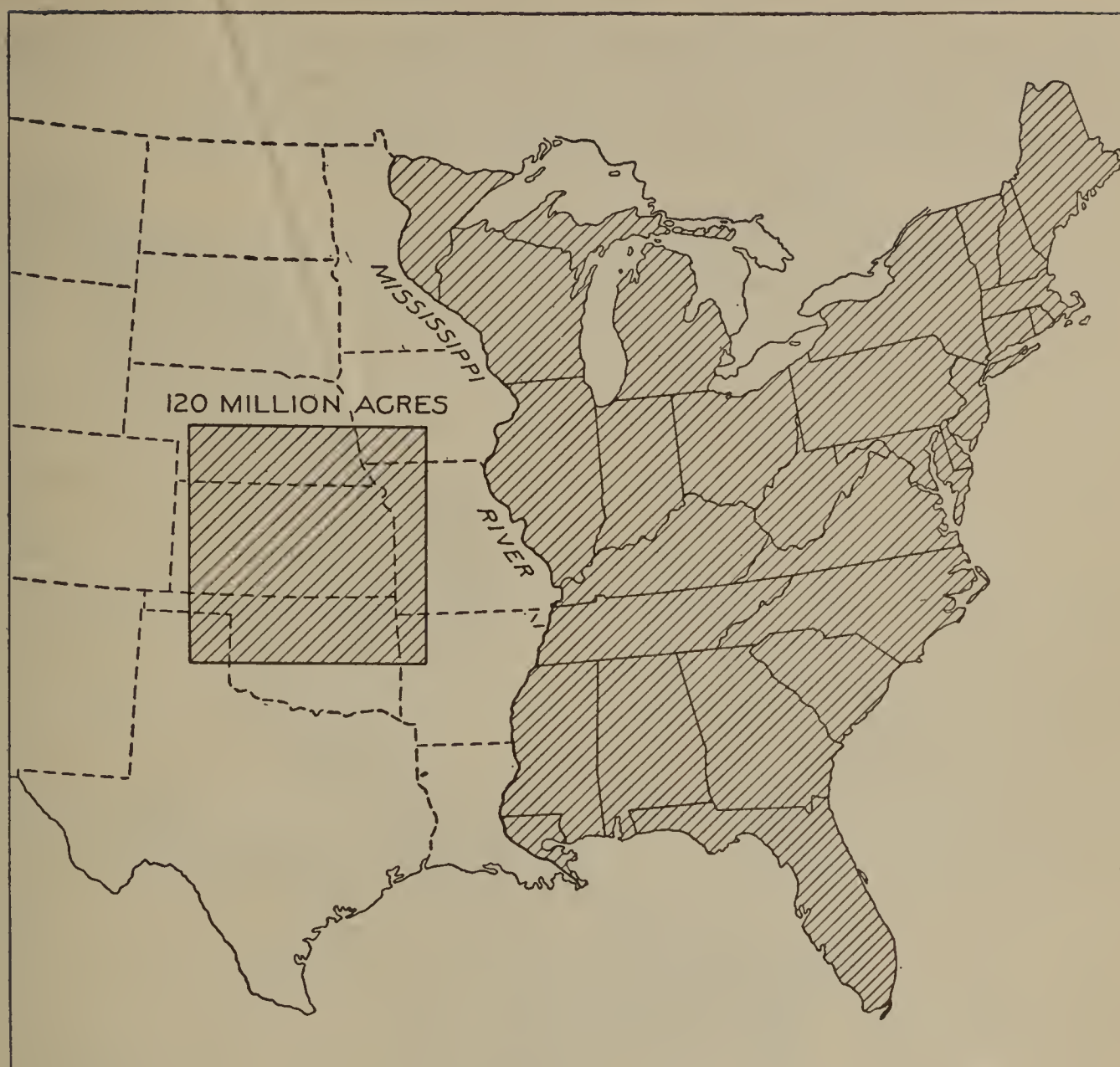


FIGURE 17.—Our forest land area would blanket the whole United States east of the Mississippi, with a substantial block of 120 million acres left over. This gives an idea of what the use of this area would mean in our national land economy.

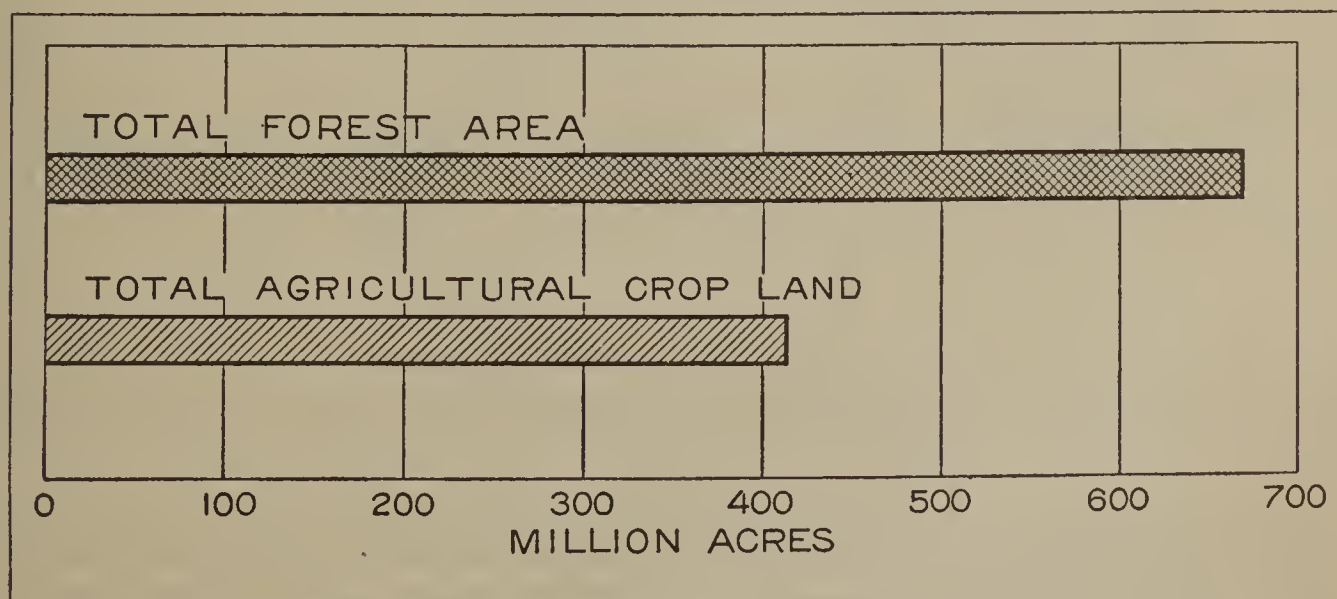


FIGURE 18.—Area involved in the forestry enterprise—half again as large as that devoted to agricultural crops.

THE MAJOR OBJECTIVES

TO GET FOREST LAND INTO PRODUCTIVE USE

From the preceding discussion it is clear that one of the major objectives in the solution of our major forest problems should be to bring, if possible, all our forest land into productive use.



FIGURE 19.—The aggregate area of six of the principal nations of western Europe does not quite equal the total forest-land area of the United States.

If the objective of full forest-land use can be reached, it will be a major contribution to the entire national land use problem, and the solution of the latter is growing cause for grave national concern.

TO MEET NATIONAL REQUIREMENTS FOR FOREST PRODUCTS AND SERVICES

It is equally clear that the second major objective in the solution of our major forest problems should be to insure, if possible, supplies

of timber and other forest products and byproducts and of watershed protection and other services adequate to meet national requirements.

If this objective can be reached, it will never be necessary to lower our standards of living or to retard our progress because ample and cheap supplies of the products and services of the forest are unavailable.

TO OBTAIN THE FULL ECONOMIC AND SOCIAL BENEFITS OF THE FOREST

The ultimate objective is to obtain all the benefits which productive forest land, the forest itself, and supplies of forest products and services adequate for requirements can separately and collectively render to our entire economic and social structure and to our national life.

TO MEET THESE OBJECTIVES REQUIRES NATIONAL PLANNING

LAISSEZ-FAIRE POLICY OF PRIVATE OWNERSHIP HAS NOT SUCCEEDED

Laissez-faire private effort, upon which the United States has largely depended up to the present time and which is avowedly planless from the national standpoint, has seriously deteriorated or destroyed the basic resources of timber, forage, and land almost universally. It has not concerned itself with the public welfare in protection of watersheds. It has felt little or no responsibility for the renewal of the resources on which its own industries must depend for continued existence and much less for the economic and social benefits growing out of the perpetuity of resources and industry. Even in fire protection, its most conspicuous constructive action, the public has largely carried the financial burden.

The record of the past sharply raises the question of how much further main dependence can and should be placed upon this policy to meet the major objectives specified.

The outstanding progress in American forestry to date has been where the public has taken things into its own hands in the ownership and management of lands, as for example, the national forests, or in the organization and leadership of such activities as protection against fire, or against such threats as the gypsy moth or the white pine blister rust.

These public efforts are, at bottom, first steps toward national planning. In any case, an expansion of public effort in the direction of national planning could hardly make a worse showing than has private ownership in either resource destruction or resource renewal.

THE LONG-TIME CHARACTER OF FORESTRY IN ITSELF REQUIRES NATIONAL PLANNING

The need for 80 to 150 years to grow high-grade material indicates the importance of the time element in forestry, but the fact that growth cannot be increased to current requirements much if any before the end of the present century is still more significant.

Furthermore, to obtain even these results will necessitate vastly increased efforts in practically all parts of the country, including such things as widespread, long-continued restraint in cutting over the entire East to build up growing stocks.

THE MAGNITUDE AND COST OF THE UNDERTAKING NECESSITATE
NATIONAL PLANNING

Despite all efforts to date, total growth in our forests is only half the total drain, and growth of saw timber only one-fifth the drain. We still have millions of acres of devastated land and more millions of deteriorated forest. The processes of devastation and deterioration are continuing on a large scale.

It is obvious that millions of acres must be put under intensive forest management, the production of millions more increased by better methods of cutting and fire protection, millions of acres planted, the scale of research greatly increased, aid to private owners increased, and public ownership greatly enlarged.

It follows that both the magnitude and the cost of the programs required will be so great that they will necessitate the maximum possible effort of all agencies for years to come. They will also require the fullest possible coordination of these efforts.

Without national planning the necessary effort would be almost out of the question, and serious, costly, time-consuming mistakes would be inevitable.

THE IMPOSSIBILITY OF DOING EVERYTHING AT ONCE NECESSITATES
NATIONAL PLANNING

Entirely aside from the inherent time element of growing timber, or at least that of high quality, all progress so far made in American forestry has been time consuming.

It has required 42 years from the setting aside of the first national forest from the public domain to acquire and put under administration the 157 million acres from this source. It has required 22 years to purchase 4,727,680 acres of national forests.

New York began in 1883 to build up its present holdings of 2,500,000 acres. The protection of private lands against fire has risen to 212 million acres as a result of 45 years of effort. It has required in the neighborhood of 30 years' effort by industrial owners to put approximately 2½ million acres under sustained yield management. Planting by all agencies has to date covered less than 2 million acres.

It follows that time must be reckoned with seriously; that everything cannot be done overnight; that progress must be made step by step; and in short that the time required to get things done emphasizes the need for national planning.

It seems conclusive, therefore, that national planning is absolutely necessary for meeting the three major objectives in the solution of our major forest problems, which can be summed up in one, to obtain the full economic and social benefits of the forest. National planning is so essential that it could itself be classed as a major objective.

THE REQUIRED ACTIVITY PROGRAMS IN A NATIONAL
PLAN

The national plan recommended falls into two groups of programs, one of technical activities, which is outlined here, the other in the following subsection of the most effective agencies and means for carrying out these activities.

For clarity the areas already shown to be available for forestry in the United States are summarized in the following tabulation:

	<i>Acres</i>
Commercial forest land.....	494, 900, 000
Reserves, parks, etc.....	11, 000, 000
Noncommercial forest land.....	108, 700, 000
Abandoned agricultural land, etc.....	54, 700, 000
Total.....	669, 300, 000

Ordinarily in forest management the same area can be used for several purposes.

By far the largest areas are needed for timber production and watershed protection. The management and protection necessary for timber production will in most cases fully meet watershed and other requirements, although multiple use of the same area may often necessitate coordination.

The largest reservations needed for exclusive use are for recreation, but even here important services in watershed protection may often be rendered and a home furnished for wild life.

ADEQUATE PROVISION FOR TIMBER PRODUCTION

The area available for timber production is about 509 million acres:

	<i>Acres</i>
Total area of forest land.....	669, 300, 000
Noncommercial forest land.....	108, 700, 000
Reserved for recreation, etc.....	52, 000, 000
	160, 700, 000
Area available.....	508, 600, 000

THE AREA NEEDED AND THAT WHICH COULD BE USED FOR TIMBER PRODUCTION

Because of such factors as fertility, accessibility, and character of ownership, the management for timber production employed will probably vary from intensive practice designed to obtain the largest possible timber crops as a maximum to simple protection against fire as a minimum.

Full use of the land available for timber production might take about the following form:

	<i>Acres</i>
Intensive timber management.....	100, 000, 000
Extensive timber management.....	338, 900, 000
Simple protection on land relatively unfavorable for timber management.....	69, 700, 000
Total.....	508, 600, 000

This full land use, when fully effective 60 or 80 years hence, should be able to produce about 21½ billion cubic feet of timber in contrast with possible normal requirements of 16½ billion. In the large saw-timber class it would produce about 74 billion board feet as compared with possible normal requirements of 55 billion.

Unless, therefore, American requirements for timber increase, this plan would offer a substantial surplus for export. The existing conditions which indicate the probable availability of such a market have already been described.

A plan of land use, which with a reasonable margin of safety would approximately balance the national timber budget, is shown by the following tabulation:

	<i>Acres</i>
Intensive timber management.....	70, 000, 000
Extensive timber management.....	278, 900, 000
Simple protection on land relatively favorable for timber management.....	40, 700, 000
Simple protection on land relatively unfavorable for timber management.....	69, 700, 000
Total.....	459, 300, 000

By approximately the end of the century this adequate timber supply plan could be expected to produce about 17½ billion cubic feet and balance possible normal requirements with a margin of safety of 1 billion. Saw-timber production would reach about 60 billion board feet as compared with possible normal requirements of 55 billion.

This plan would leave about 50 million acres available for other purposes or as idle land:

	<i>Acres</i>
Denuded forest land.....	33, 500, 000
Unused agricultural land.....	15, 800, 000
Total.....	49, 300, 000

The various activities which are essential to both plans are so important that separate detailed consideration is necessary.

PROTECTION AGAINST FIRE

The following program for the control of forest fires covers all classes of forests for all forms of use rather than commercial forests for timber production only. It deals mainly with commercial forest land, but also with noncommercial forest chiefly valuable for watershed protection and grazing and of areas reserved for recreation.

The program is based in part on the certainty of occurrence of forest fires as a result of human occupancy and use. That fires are bound to occur is shown by a country-wide average of over 156,000 fires and of nearly 41½ million acres burned over annually in the 5-year period between 1926 and 1930.

In addition the program set-up has recognized the area needing but not now receiving protection, or 191 million acres, the difference between 512 and 321.

A further basis for the program is a determination of the allowable burn, or the percentage of the area by types that may burn over annually without impairing radically the forest values as determined by the predominant purpose of management.

An examination of how closely this objective has been reached under current expenditures affords still another criterion for the required program. Current annual expenditures for 1926 to 1930 of \$5,437,598 on the national forests, including \$1,780,840 capital investment in roads, etc., give a ratio of actual to allowable burn of 1.07 to 1, but an area of approximately 30 million acres on the Pacific coast and in the northern Rocky Mountains needs much more intensive protection to reduce a ratio of 5 to 1.

A ratio of nearly 11 to 1 on areas outside of the national forests shows that expenditures of \$5,400,000 for 1927 to 1930 must be ma-

terially increased. Wholly unprotected areas, mostly in the South, are chiefly responsible for this high ratio, since on protected private and State forests for the entire country the ratio is 1.70 to 1.

Based upon these considerations, it is estimated that the ultimate cost of adequate fire protection on areas outside of the existing national forests will be nearly \$20,000,000.

On the existing national forests \$10,649,000 will be needed, of which \$4,279,000 is current expenditures and the remainder capital investment.

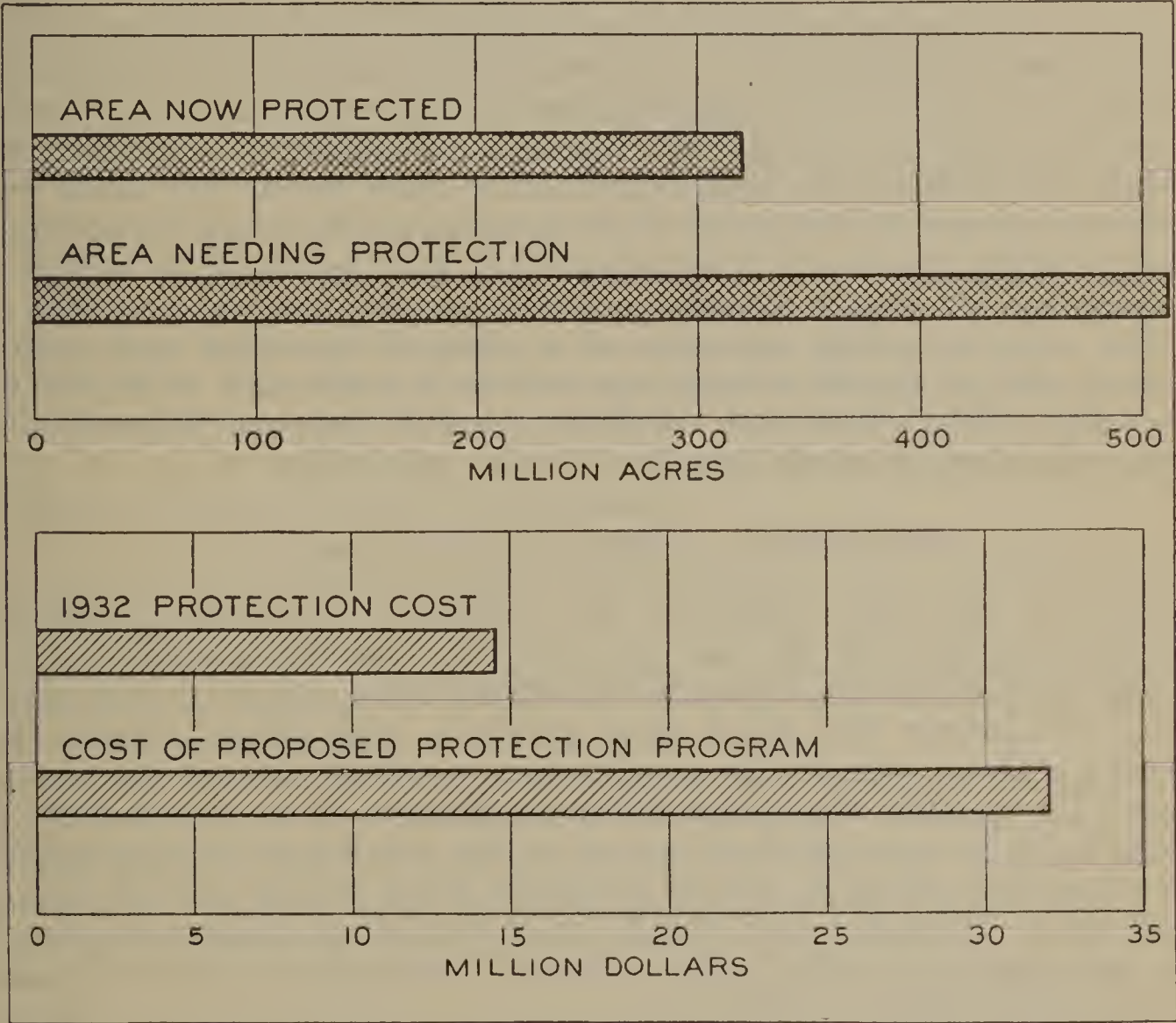


FIGURE 20.—A desirable standard of fire protection will require the enlargement of the area now under protection by 60 percent and the increase of 1932 expenditures by 120 percent.

An adequate program will also require the following increases:

	From—	To—
Indian forests.....	\$94, 528. 00	\$450, 000
Public domain.....	65, 333. 00	723, 598
National parks.....	95, 324. 85	159, 636

The total annual price which the American people will have to pay to control the scourge of forest fire is therefore about \$32,000,000 as against 1932 expenditures of \$14,475,000.

The area and financial aspects of the proposed program are also shown in figure 20.

PROTECTION AGAINST FOREST INSECTS

Insects cause losses in forest stands and in forest products estimated at over \$100,000,000 annually. They lower timber yields and retard the growth of young stands. Frequently they change the composition of the forest to such an extent as to necessitate complete reshaping of management plans. They create serious forest-fire hazards. They damage or destroy finished wood products.

A well-organized detection and control system is essential to detect outbreaks of native insects in their early stages. The failure of some control projects has resulted from tardiness in recognizing an active infestation or from lack of complete information as to its virulence and extent. Costs in time and money are greatly increased unless control is begun promptly. Regional forest-insect surveys on a cooperative basis have been organized to meet needs but these have not been carried to the point where forests can be zoned according to susceptibility to insect infestation and the values that would be endangered by insect attack.

The cost to public agencies of a general detection and control system and of special control operations is estimated at \$2,750,000 annually. This does not include needed private expenditures. Serious epidemics would require special provisions.

PROTECTION AGAINST FOREST DISEASES

Each of the many valuable tree species of the United States is subject to attack by one or more species of parasitic plants. Some of the great number are capable of killing trees, others merely injure them or destroy the wood they produce, and others retard their growth. Some attack the germinating seedling, others the mature tree. To identify the many different diseases that attack trees, to determine the cause of their spread or the conditions or management practices that affect it, and to ascertain what strains or varieties are resistant to them for even the 25 most important timber species, at the rate possible to the present force of investigators, would require not less than half a century.

Except for research, the outstanding need of forest pathology is a control service which will act in both a control and an advisory capacity.

The control campaigns now under way, particularly on the white pine blister rust in the East, and on the white and sugar pine forests of Idaho and California, should be carried to completion.

Measures for the control of forest diseases are mainly but not all indirect, consisting principally in modification of forest management. Actual disease-control work on private land can largely be handled by the owners of the land. Effective methods must, however, be based on a comprehensive knowledge of the influence of soil, climatic, and other factors on both the parasite and the host.

The dissemination of the knowledge which is available in several organizations including the Division of Blister Rust Control of the Bureau of Plant Industry requires an organization of experts. It would seem logical to expand the scope of this Division to include other forest-tree diseases.

Quarantines now established should be strengthened to prevent the introduction of further diseases, and interstate shipments, particu-

larly between the East and West, should be watched to prevent native or introduced diseases prevalent in one region from becoming established in another.

The annual cost to public agencies of the program outlined is estimated at approximately \$3,750,000. The largest item is \$2,000,000 for white pine blister rust on the national forests which would be reduced to \$300,000 after 5 years. As in the case of insects, special provision would be necessary for serious epidemics.

HOW TO STOP FOREST DEVASTATION

The fact that more than 60 million acres of forest land in the United States are already devastated fully justifies drastic action to prevent any increase. Even though the estimated further devastation of 850,000 acres each year may possibly be fully offset by the return of an equal area to productivity, the years of delay in the return and its high cost constitute whatever further justification may be needed for a program of preventive measures.

The major cause of forest devastation is fire and usually fire following cutting. The fire protection program outlined would alone go far toward stopping further devastation in most forest regions. It would also permit the gradual reforestation through natural process of much of the area already devastated.

Other measures needed on the greater part of the 9½ million acres now cut over annually without any conscious regard to the future of the forest are:

1. Preservation of young seedling growth already on the ground at the time of logging, or of the seed-bearing trees needed to reforest the land after logging.

2. Slash disposal by some form of controlled burning or other means on all areas where it constitutes a serious threat of destructive fires. Partial disposal may be one satisfactory alternative; special protection of cut-over land until the slash hazard is reduced is another.

3. In a comparatively few forest regions prevention or at least the careful control of grazing on reproducing areas will be necessary.

Aside from general fire protection, in the cost of which the public shares, these measures are not expensive.

Frequently the necessary seed trees can be cut only at a loss. Slash disposal will often more than justify itself from the standpoint of protecting remaining stands of timber. In many cases measures going considerably beyond those required to prevent forest devastation will be found to increase immediate profits rather than to reduce them. In fact in more cases than are realized forest lands can probably be devastated only at an immediate financial loss.

The total cost for the entire country, other than general fire protection, for stopping forest devastation, is estimated at not to exceed \$6,000,000. If the full facts were available, the balance would probably be found to be on the other side of the ledger and in a much larger sum.

EXTENSIVE FOREST MANAGEMENT

Extensive forest management lies between the measures necessary to stop forest devastation and intensive forest management.

The data at hand do not permit an accurate determination of how much forest land in the United States now qualifies under this classi-

fication by reason of a growth rate resulting from conscious effort or otherwise. It may perhaps total 110 million acres.

This area as shown in figure 21 would have to be raised to about 279 million acres by about 2000 A.D. to meet timber requirements and to 339 million acres to insure full forest land use. The annual increase in the area brought under extensive management during the next 70 years would therefore have to be about $2\frac{1}{2}$ or $3\frac{1}{4}$ million acres, depending upon the objective set up.

Extensive management would produce an average of about 42 cubic feet per acre annually, or two thirds of the full forest yield to be expected under intensive management. It represents a marked advance over the estimated current average growth of 21 cubic feet annually for the entire area of commercial forest land in the United States. The growth for individual types and regions would have to be increased from 50 to 200 percent.

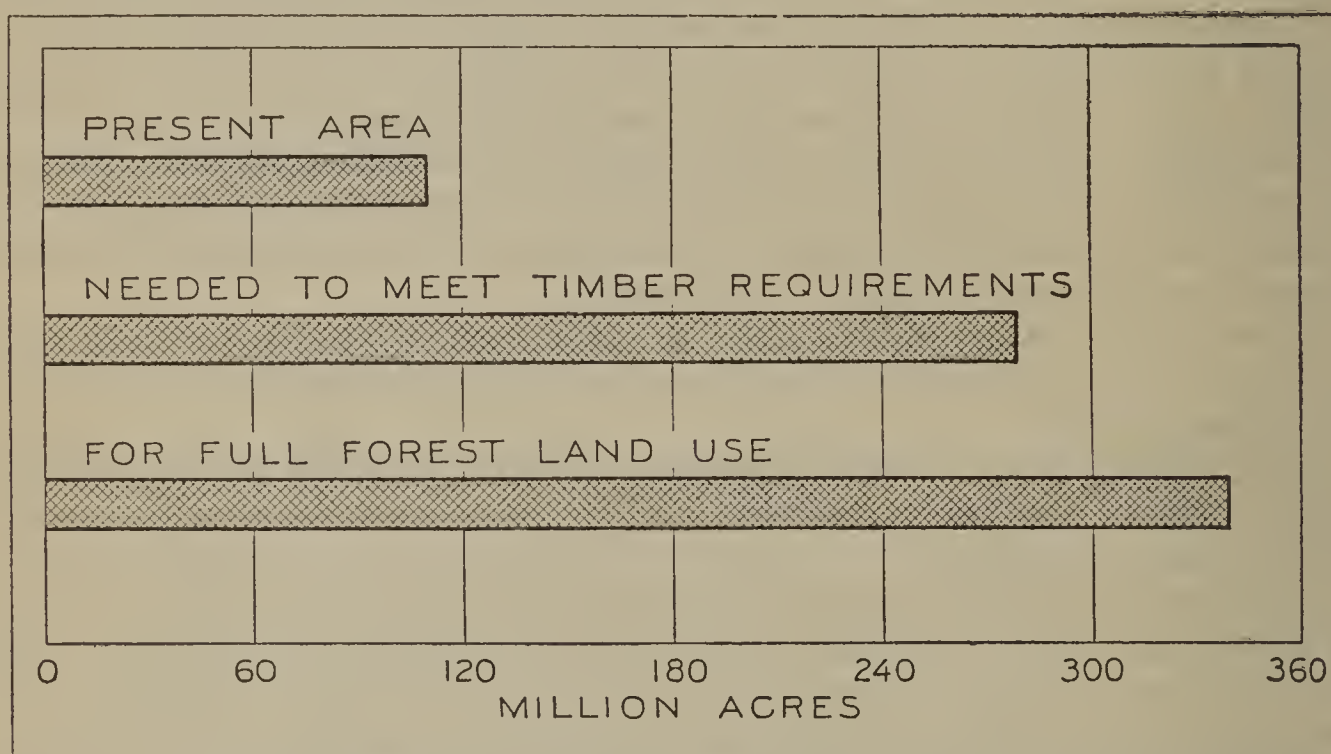


FIGURE 21.—To insure timber supplies adequate for national needs an area of 279 million acres should be placed under extensive management during the next few decades; and to insure full land use an area of 339 million acres.

Extensive management presupposes the levels of protection against fire, insects, and diseases already outlined. It uses relatively simple silvicultural methods such as the protection of advance reproduction, the leaving of at least the trees which cannot be cut with profit, additional seed trees where necessary, some attention to keeping the better species in the stand, slash disposal, and the prevention of injurious grazing. It places more emphasis on quantity than on quality of production. It attempts at least a rough application of the sustained yield principle. It would not ordinarily require planting or cultural measures in growing stands. It is characterized by a minimum of effort and low costs which may actually in most cases be found to be savings.

It may in some cases be a necessary first step to intensive forestry. Over large areas low in productivity or inaccessible to markets, it may be the most desirable ultimate practice.

INTENSIVE FOREST MANAGEMENT

Intensive forest management on 70 million acres is one of the measures needed to meet national timber requirements.

To bring the area available for timber growing into full productive use that under intensive management should be increased to 100 million acres.

To reach these objectives it will be necessary to expand the area under intensive management at the rate of about 1 or of 1½ million acres annually for about 70 years. The magnitude of the program is indicated graphically in figure 22.

The provision for intensive forest management is based on the theory that it is better to concentrate a substantial part of the effort in timber growing on the most favorable areas than to diffuse it over the entire area available.

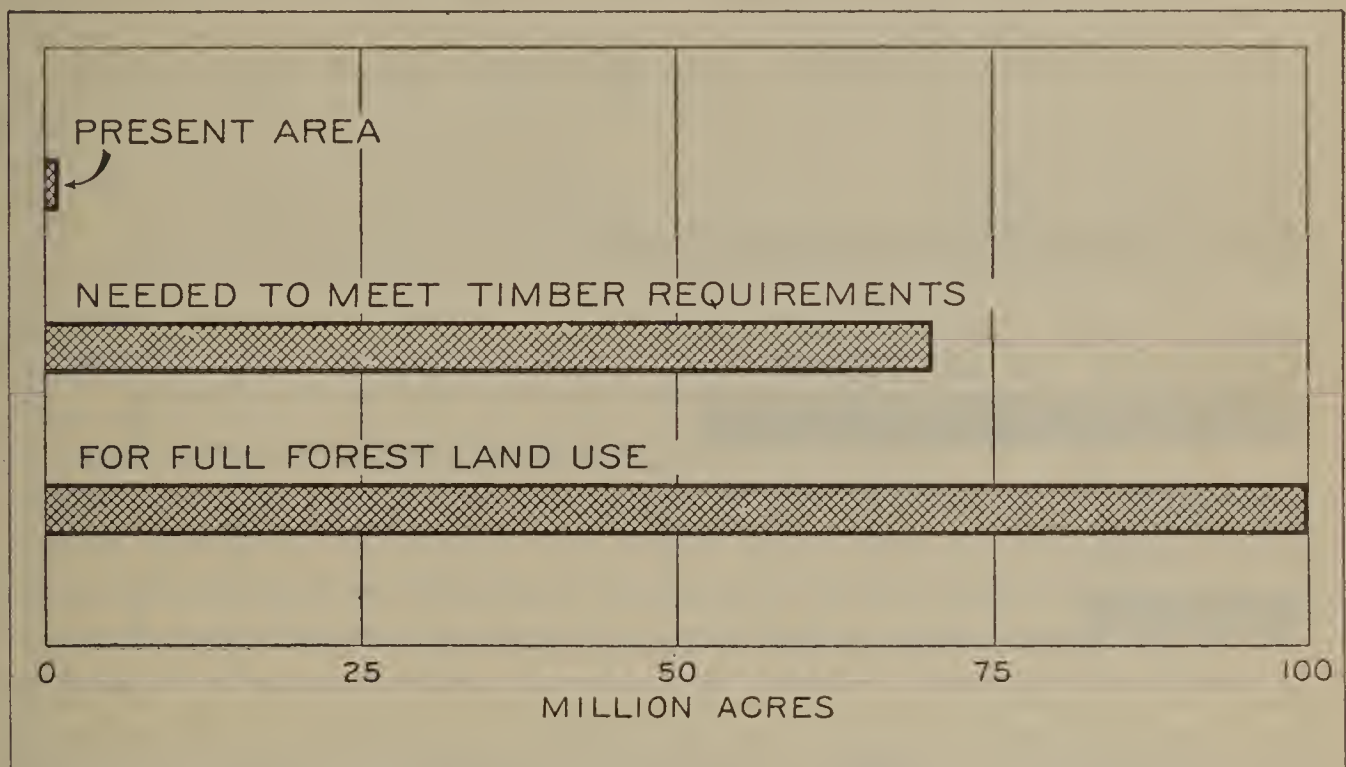


FIGURE 22.—The negligible area now under intensive forest management must be increased to 70 million acres to meet national timber needs. A program of full land use would place 100 million acres under intensive management.

Intensive forestry aims to realize through silvicultural treatment the nearest practical approach to the maximum productivity of a given site, or to grow by particular effort some special quality of product.

If the areas on which it is to be used are properly selected with reference to volume and value of production, accessibility to market, and risk, intensive forestry offers the promise of the highest volume, quality, and money return per unit of effort and cost. It offers the best means for producing the large-size, high-quality material and special products such as clear finish and flooring, which are likely to be scarce in the future and which are not likely to be produced without special effort.

It presupposes fire, insect, and disease control.

Under different conditions intensive forestry requires a wide variation in methods of cutting to insure natural reforestation of the best species. It requires cultural measures such as weeding, girdling, thinning, and pruning to carry young stands to maturity in the shortest possible time with the highest yields of desirable species and

qualities. In some cases it is necessary to refrain from cutting in order to build up the forest capital essential to full growth. Planting is necessary where natural reforestation fails.

PLANTING

Although logically a part of intensive forestry, the area of barren land requiring planting is so large that a separate program is justified.

The area which must be considered for planting includes 83 million acres of nonstocked or poorly stocked forest land. It includes also 55 million acres of abandoned submarginal agricultural land, making a total of 138 million acres.

It is estimated that 47 million acres of this total will restock naturally within 20 years and 68 million within 40 years, leaving unstocked balances of 91 and 70 million acres, respectively.

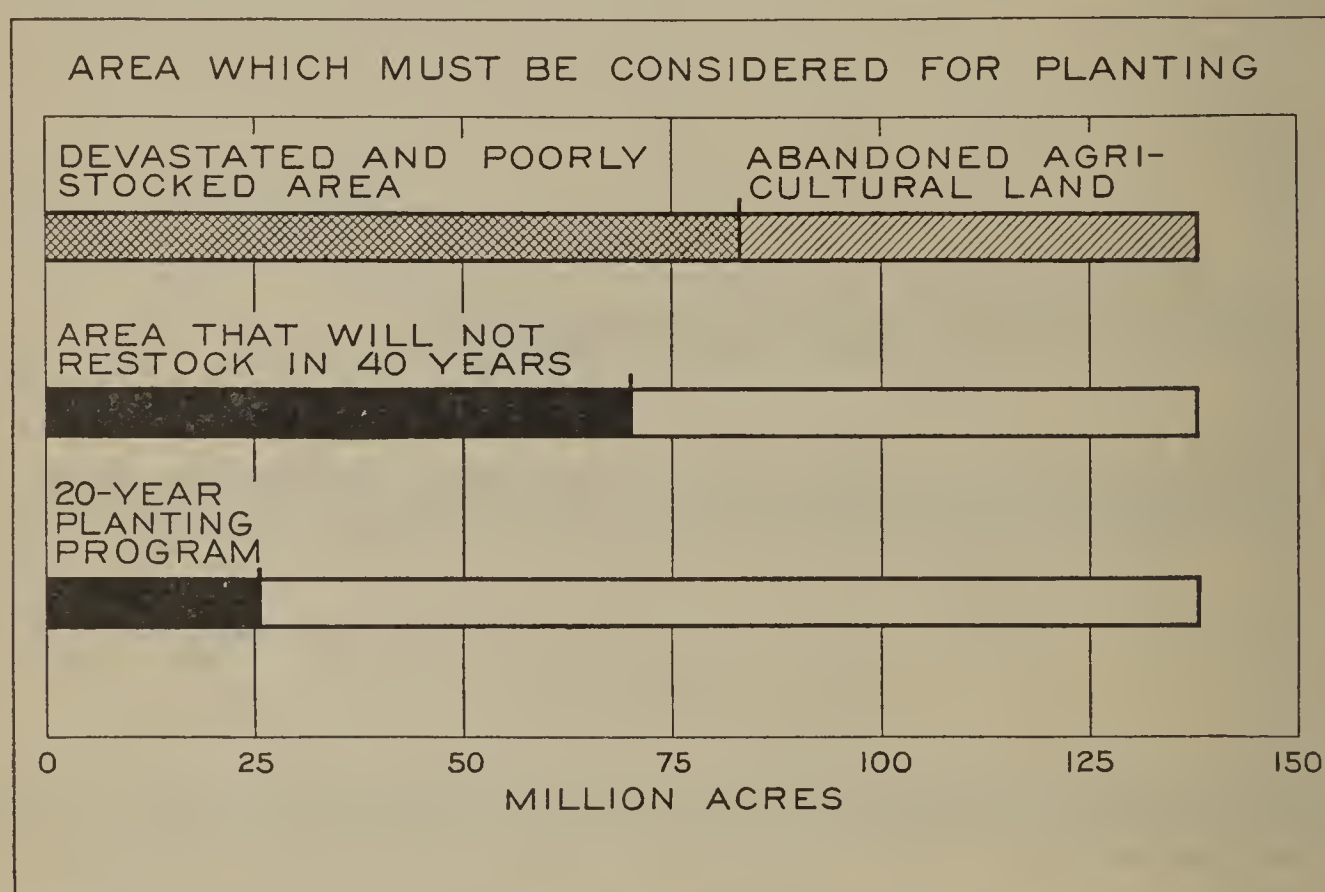


FIGURE 23.—Maximum planting possibilities are measured by 138 million acres of devastated and poorly-stocked forest and abandoned agricultural land. To provide for the planting, within 20 years, of even a scant fifth of this area represents a great advance in the current rate of planting. This program will, however, account for a substantial portion of the 70 million acres that would otherwise remain waste even after four decades.

The justifications for planting are those of forestry itself, timber production, erosion control and streamflow regulation, and in general the economic and social benefits of the productive forest.

Planting to date in the United States has covered 1,892,105 acres, including 153,460 in 1931. Large numbers of private owners, the Federal Government, States, and other public agencies have participated. While not uniformly successful, planting technique has improved steadily.

The 20-year planting program recommended is based on the most urgent watershed and timber production needs. It provides for 25 million acres, figure 23, nine tenths in the East. It would probably cost about \$172,000,000, or an average of \$8,600,000 for 1,276,000 acres annually.

Depending on the rate and extent of public acquisition, the public share of the total might be about 19.5 million acres, costing about \$151,500,000. The private owners' share would be 5.5 million acres, costing \$20,500,000.

ENLARGING THE CONSUMPTION OF FOREST PRODUCTS

In the United States until recent years wood has been the accepted material for a great variety of purposes and especially for general building construction.

Uses long held by wood are, however, being contested by old materials refined by science and by new materials of scientific origin promoted aggressively with the aid of intensive technical knowledge of their properties and the requirements for their use. Since 1907 there has been a declining trend in lumber markets. The use of wood for fuel has also decreased. The declines have not been offset by increased use for such purposes as pulp and paper.

The increasing interchangeability of materials may be expected to bring about the decreasing use of almost any material which attempts to rest its case solely on past importance.

The productive use of a large part of our forest land for timber growing is so important to the people of the United States that a balanced program in forestry must include aggressive and persistent efforts to retain, recapture, and expand markets for wood. Efforts of this kind offer in part at least the solution to such problems as the existing overproduction in the lumber industry.

A much fuller use in the future than in the past of the modern competitive methods followed for other materials is required. Accomplishments along four lines are necessary: lower costs to the consumer, increased satisfaction in use through fuller understanding of or improvements in properties, the development of new or modified products, and the promotion of use.

Among other things, greater industrial efficiency in logging, manufacture, distribution, and merchandising are involved. So also is the integration of forest industries.

Research can be made to contribute to most if not all of these ends through better understanding of the properties of wood and how they can be modified, and of how best to meet the requirements for exceedingly varied use. It can also contribute through the development of new and valuable products.

The distinct possibility that world markets in the future may be able to absorb any surplus, particularly of coniferous timber, that may be grown in the United States does not minimize the desirability or the necessity from the standpoint of the public interest if from no other, for keeping wood in effective competition with other materials in the United States.

ADEQUATE WATERSHED PROTECTION

Adequate watershed protection requires the improvement of various phases of land management, the details for most of which are outlined elsewhere. Such protection is particularly important on 308 million acres of forest estimated to exert a major watershed influence, and on the 141 million additional estimated to exert a moderate influence.

LAND MANAGEMENT

Among the most important improvements in management needed are protection against fire, which should be extended over 191 million acres additional and raised to the standards already indicated.

Methods of cutting timber must be improved at least to the extent necessary to prevent forest devastation and preferably to the requirements of extensive forestry.

About 11 million acres of devastated forest and abandoned sub-marginal agricultural land, almost entirely in the East, should be planted primarily to meet watershed requirements.

Range management must be begun on both privately owned forest ranges and those remaining on the public domain to build the forage cover up to normal density. Management must be brought to a higher degree of perfection on the national forests and Indian reservations. Artificial revegetation of some 900,000 acres at a cost of

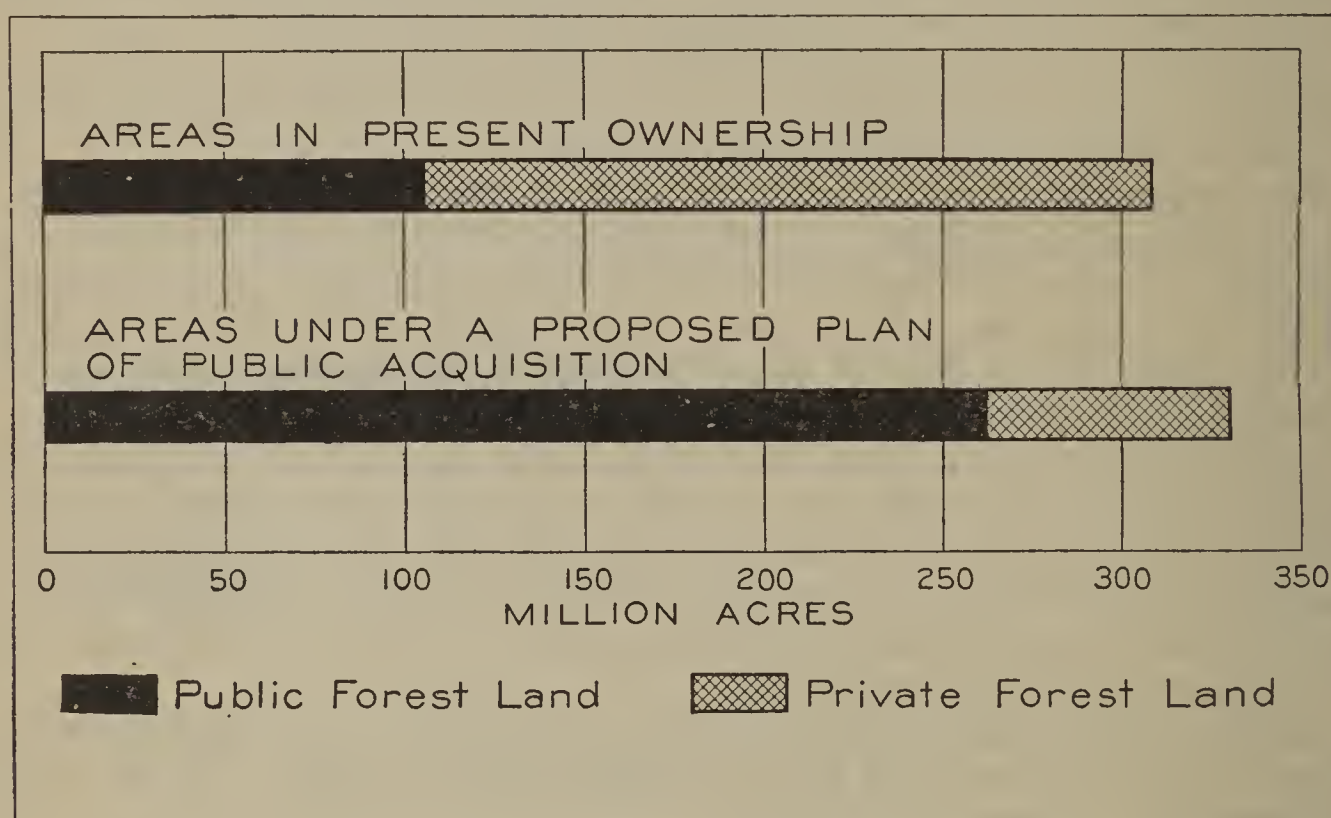


FIGURE 24.—Nearly all of the most critical watershed problems center in privately owned forest or abandoned agricultural lands of major watershed influence. A much larger public ownership is believed to be the only satisfactory solution.

\$3,000,000 is desirable. The requirements in range management are largely western.

Special measures, frequently of an engineering character, may be necessary as a last resort on perhaps 20 million acres mainly on abandoned agricultural land in the East, at a possible cost of about \$20,000,000.

PUBLIC ACQUISITION

The watershed protection problem is largely one of privately owned lands. Since a substantial part of the benefits will accrue to the public and not to the landowner, necessary action on very large areas can hardly be obtained except through public ownership.

Public acquisition of 155 million acres of privately owned lands, three fourths in the East and including 22 million acres of abandoned agricultural land, is therefore recommended for this purpose alone. These lands are in forest areas having major or moderate influence on

watershed protection. The proposed shift in ownership in the area of major influence is shown in figure 24.

The lands already under Federal, State, or other public ownership but without administration are a special case. In their present condition they are a public disgrace. Formal reservation as national or State forests or other units permitting administration is the first prerequisite to management and administration.

LANDS UNDER PRIVATE OWNERSHIP

The lands that remain in private ownership will be put in a much more satisfactory condition for watershed protection by the fire program recommended and this should be done with public aid. Further improvement depends largely upon the owner, although here also the public aid recommended in such ways as planting stock at low cost, advice, etc., will be helpful.

ADEQUATE PROVISION FOR FOREST RECREATION

The use of the forest for recreation has received so little attention and the need for it is and should be assuming such proportions that the first requirement is for a survey to determine what types of forest recreation are particularly desired and how much land should be set aside for each.

Although almost any forest may be used for recreation, the following types require especial consideration:

Superlative areas.—Those with unique scenic values so surpassing and stupendous in their beauty as to be of unusual interest and inspiration.

Primitive areas.—Tracts of old growth timber in which human activities has never upset the normal processes of nature.

Wilderness areas.—Those without permanent inhabitants or means of mechanical conveyance, and of sufficient size to permit a week or two of travel without crossing one's own tracks.

Roadside areas.—Timbered strips adjoining important roads.

Residence areas.—Those set aside for private homes, hotels, etc.

Campsite areas.—Those set aside for campers, etc.

Outing areas.—Those not seriously impaired scenically on which one can get away from the sounds of the highway.

For most or all of these it will be necessary to consider and provide in varying degree for such things as:

Finding suitable areas;

Setting them aside under suitable auspices, or for public purchase or acceptance as gifts;

Making suitable plans for their administration, including the enforcement of necessary regulations, the construction of needed roads and trails, or other forms of improvements, or the barring of roads and trails; planting; prohibition or restriction in timber cutting;

The elimination of billboards, etc., and objectionable private improvements such as buildings; and

Provision for protection against fire, insects, and fungi.

Federal, State, and local legislation and appropriations will be necessary. The most needed legislation may be congressional authorization to develop and safeguard the recreational, educational, and inspirational value of the national forests.

So far as can now be foreseen, the area which will probably be needed primarily for forest recreation, including 11 million acres already withdrawn from timber use, is:

	<i>Acres</i>		<i>Acres</i>
Superlative areas-----	3, 000, 000	Residence areas-----	6, 000, 000
Primeval areas-----	9, 500, 000	Outing areas-----	11, 000, 000
Wilderness areas-----	10, 000, 000		
Roadside areas-----	4, 000, 000	Total-----	45, 000, 000
Campsite areas-----	1, 500, 000		

ADEQUATE PROVISION FOR FOREST WILD LIFE

An adequate forest wild-life program must, among other things, obtain the best development and use of forest wild life as a product of the land in proper coordination with other products and services, make it possible for wild life to meet aesthetic, scientific, and other social services, and preserve the American hunting tradition. What is most needed to obtain these ends is forest wild-life management.

Upon suitable management depends the restoration and maintenance of wild life in a normal balance as between species and with other forest resources, distribution into proper environmental conditions, the preservation of species now threatened with extinction, and sustained yield of the wild-life crop, particularly of game and fur bearers.

The unification of wild-life and forest-land management is a second essential requirement of a program. Unification is made difficult by the fact that, in general, control of game is in the State while the ownership and control of the land and other forest resources with which wild-life management must be coordinated may be private or Federal as well as State.

Unification can be accomplished on privately owned lands by compensating the owner directly or indirectly for producing game crops.

On national forests and other Federally owned lands the working out of satisfactory arrangements constitutes an important but still unsolved problem.

The third requirement in a forest wild-life program is adequate provision for public hunting grounds. This requirement can be met by the program of public acquisition of forest lands recommended in another program.

Still another requirement is the establishment in all States of active nonpolitical game commissions with full authority to regulate seasons, bag limits, license fees, closed areas, and other phases of wild-life management.

The area of forest land in the United States is large enough fully to meet all wild life requirements.

The provisions needed in an adequate program for fish in forest waters are in general similar to those for mammals and birds in management, unification of control, public fishing grounds, and active nonpolitical game commissions with full authority.

A proposal of the Bureau of Fisheries for the expansion of a fishery survey begun in the western national forest regions requires special mention. One purpose is the development of a national policy for stocking national forest and other public domain waters.

Another needed measure is the coordination of the activities of the various agencies of the Federal, State, and local governments dealing with the fish problem into a general program.

ADEQUATE PROVISION FOR FOREST RANGES

The outstanding need for forest ranges is sustained yield management properly coordinated with the management of timber, watershed, wild life, and other forest resources.

For the ranges on the 190 million acres of privately owned commercial forest lands, the incentive is a return from grazing which in many instances can be made a material factor in meeting costs and increasing profits. Only coordinated sustained yield management, however, will insure the largest returns without interfering with timber production.

On noncommercial forest lands in private ownership of 38 million acres the range use may be dominant. Sustained yield management offers the only means for obtaining the largest continuous returns.

Watershed requirements will ordinarily but not always be met by thoroughly effective management for the timber and range resources. But satisfactory range management purely from the standpoint of continuous forage production is about as far as the unaided private owner can be expected to go.

Publicly owned or managed forest lands fall into two classes. One class includes the National and State forests and the Indian reservations. The need here is for perfecting management including the restoration of depleted ranges.

The second class includes the forest lands of the western public domain, 13 million acres of which, along with 9 million of interspersed nontimbered lands, should be added to the national forests and placed under management. The remainder, consisting of small, widely separated areas, usually parts of larger range areas, should be placed under a form of public administration which will assure satisfactory management.

ADEQUATE PROVISION FOR FOREST RESEARCH

Since lack of knowledge has handicapped the whole forestry movement, adequate provision for it is one of the essentials in a comprehensive national plan for the future development of forestry.

Such lack is one among the many factors which have led to the long series of mistakes in public and industrial policies which have created our most critical forest problems.

Such lack accentuated by the absence of traditional knowledge is one among the many factors which have delayed constructive remedial measures in growing and protecting timber, decreased their efficiency increased their cost, and discouraged efforts to put them into effect.

The building up of research has in practically all cases fallen seriously behind the creation and management of public forests and attempts to formulate State and national policies.

The great enlargement and intensification of the program recommended in this report for all phases of forestry in themselves demand a corresponding development of research by all agencies.

BY THE FEDERAL GOVERNMENT

Research in the Forest Service covers silviculture, forest management, and protection against fire, range management, erosion and streamflow, forest products, and forest economics including the Forest Survey.

Five years' development under the McSweeney-McNary Forest Research Act has shown the need for several modifications.

One of the most important is to double the authorization for annual expenditures of \$250,000 in the Forest Survey in order to expedite its completion. National plans such as that presented here must of necessity be modified periodically to meet changing conditions. To help supply the data needed, provision should also be made for keeping important factual data current after the completion of the initial Survey.

The second is to add a section to the act which will place investigations of the crucial erosion-streamflow problem on the same footing as other forest research, and authorize annual expenditures of \$500,000.

A third, which might if desirable, be incorporated in general legislation for all land, is to authorize a maximum annual expenditure of from \$250,000 to \$400,000 for the forest land part of land classification.

Under the research act thus amended the 10-year financial program of annual increases for all research in the Forest Service would start at \$565,000 and end at \$315,000.

Detailed estimates cannot be made satisfactorily for a longer period, although it is practically certain that unfilled needs will then necessitate further increases.

The Forest Research Act also provides for investigations in forest pathology in the Bureau of Plant Industry, in forest entomology in the Bureau of Entomology, in forest biology in the Biological Survey, and in forest fire weather research in the Weather Bureau. The need in all is to increase appropriations to the full amount of the authorizations by the fiscal year 1938. Increases for all this work would average about \$100,000 annually. The need is also to provide for whatever emergencies may result from serious epidemics.

For research by the Bureau of Fisheries in connection with fish cultural operations in forest waters it is estimated that an annual appropriation of \$25,000 will be needed.

The National Arboretum should also have a place in the Federal program because of the contribution which it can make to various fundamental problems. It would be of particular value because of the presence in Washington of so many scientific groups working on different phases of forest research.

BY THE STATES

Since forest research by the Federal Government must be concentrated on national and regional problems and deal with only local problems only as they are required for the management of Federal lands, a large field must be covered by the States.

It is believed that the States would be justified during the next 10 years in building up their research from current annual expenditures of about \$400,000 to \$2,500,000.

BY ENDOWED INSTITUTIONS

Completely to meet the need for fundamental forest research and to round out the efforts of other agencies, the establishment of an institution devoted solely to forest research is most desirable. It could take the form of the single, closely-knit organization recommended by the

Society of American Foresters, or of several smaller units at university centers recommended by a committee of the National Academy of Sciences, or it could take the form of various combinations of the two plans. To be thoroughly effective it should command an annual income of at least \$1,000,000.

A similar opportunity exists at endowed educational institutions and forest schools where annual expenditures of \$500,000 will more nearly represent the potentialities for forest research than current efforts costing \$120,000.

Existing endowed research institutions and arboreta could well contribute another \$500,000.

BY THE FOREST INDUSTRIES

No program of forest research can be complete, however, without providing for an enlarged contribution from the forest industries. Research is one of the most effective competitive weapons at the disposal of the lumber and other forest industries to hold and to enlarge the consumption of their products. The public cannot and should not be expected to bear the entire burden. An increase to \$3,500,000 in current expenditures of \$2,500,000 is not unreasonable.

Present expenditures for forest research by all agencies and those proposed 10 years hence are therefore:

	Present	Proposed
Federal.....	\$3, 000, 000	\$6, 000, 000
State.....	400, 000	2, 500, 000
Forest research institution.....		1, 000, 000
Endowed educational institutions.....	120, 000	500, 000
Endowed research institutions.....	230, 000	500, 000
The forest industries.....	2, 500, 000	3, 500, 000

THE REQUIRED AGENCY PROGRAMS IN A NATIONAL PLAN

THE ALTERNATIVES

Both public and private agencies are available for carrying out the activity programs outlined. The way in which these agencies can act may take various forms. The coordination of agency participation and form of action in a national plan leads into a second set of programs some of which are of great magnitude. The main agency form of action alternatives are:

1. Continued dependence on private ownership to carry the major portion of the national burden.
2. Primary dependence on private ownership, but using public aid to stimulate the necessary effort.
3. Primary dependence on private ownership, but requiring the necessary effort through public regulation.
4. Public assumption of a major part of the job through the ownership and management of the land.

Private ownership, private ownership stimulated by public aid, and/or by public regulation, and public ownership have all been tried out in the United States and all have made a sufficient contribution to American forestry and are so well established that they must be

retained. All in fact center in ownership, so that the main decision narrows down to a choice between continued chief reliance on private ownership or a drastic shift to two kinds of public ownership, State and Federal.

The reasons for recommending a large shift to public ownership and the efforts which should be made to insure much fuller use in the future of the lands left in private ownership are treated in the following pages.

PRIVATE OWNERSHIP

The traditional American policy has been to depend upon private ownership and initiative. This is largely true in forest-land ownership and management despite the departure represented in the National, State, and other public forests.

ITS POSSIBILITIES AND LIMITATIONS

The possibilities and limitations of private effort must be judged in part from past results. These have already been outlined and need not be repeated. In general, however, they have been very seriously detrimental to the owners and the forest industries, to the productivity of the forest, and to the public interest. Constructive management is conspicuous largely by its absence, except in fire protection.

The results indicated are so universal that they raise the question if they are not almost inevitable in the system of private ownership particularly under American conditions and expectations for quick business turnover and large profits. The time element, uncertainties as to cost and markets, the absence of practical demonstrations, the lack of traditional knowledge, the general inertia or opposition to radical change in long-established ways of doing things, all contribute to the difficulties standing in the way of satisfactory private forestry.

Private forestry has the possibilities common to all forestry in the United States, the intrinsic value of wood as a raw material and the fact that it is renewable indefinitely, the exceptional number and value of American species, exceptionally favorable growth conditions, the largest domestic market in the world, regional demand larger than cut in all parts of the United States except the South and the Pacific Northwest, the same opportunities to fight for future markets as any raw material, the practical exhaustion of virgin timber supplies except in the Far West, the drain on our forest five times the growth for saw timber and twice the growth of timber of all sizes, a world demand at least holding its own and probably increasing, and, for coniferous timber most in demand, a world cut in excess of growth.

Finally, there is growing evidence that under many and perhaps most conditions it is more profitable even in immediate returns to leave forest land productive than to devastate it.

Private forestry has some distinct advantages over the public forests so far created. It has the best land and it has the opportunity to supply needed raw materials to perpetuate such enterprises as pulp and paper manufacture, to supply the wood needed in mining, and to diversify agriculture. In addition, there are whatever further advantages may lie in the greater efficiency claimed for private over publicly managed activities.

One obvious advantage which would accrue from fully adequate private effort would be the elimination of any necessity for further extension of public ownership and administration of land. Another might be the best possible outlet for private initiative; still another would be the largest possible tax base and hence tax returns to local governments.

The main public disadvantage is the lack of assurance either that the land will be utilized, that the needed forest products or necessary services of the forest will be supplied, or that the combined economic and social benefits from both will be realized.

Furthermore, the longer present trends continue the larger the area of devastated land and deteriorated forest will be and the greater the direct and indirect losses to the public, including the cost of restoration.

It is difficult to escape the conclusion that there is nothing in past experience or definitely in sight for the future which gives reason for hope that private ownership can be depended on for anything approaching the contribution to American forestry that has been expected of it during the past 20 years.

WHAT PRIVATE OWNERSHIP SHOULD DO

Under the program of public ownership proposed, 255 million acres of commercial land, including approximately 20 million acres of abandoned agricultural land, would remain in private ownership, in contrast with the 451 million acres of commercial forest land and abandoned agricultural land now held. About three fifths, or 155 million acres, would be in industrial ownership and 100 million in farm ownership.

Noncommercial forests in private ownership would be about 16 million acres instead of the present 45.

Private ownership would be relieved of much of its most acute problem such as the part caused by overload of forest land and timber.

The responsibility of private ownership would, however, be increased, not reduced. It would still hold over 46 percent of the commercial forest land, including abandoned agricultural land. This area must be depended upon for growing one half of the timber needed to meet national requirements.

It would involve as a minimum intensive management for timber production on about 40 million acres and extensive management on 150 million—areas far in excess of those now under such management—and standards of protection, silviculture, and sustained yield management much above those now in use. It would involve much greater and much more effective efforts to maintain and increase consumption of forest products.

Private ownership would still hold the responsibility for watershed protection on nearly one fifth of the area of forests of major influence.

To make the opportunities for private owners still more favorable and the assurance of constructive action more certain, public aid should be expanded in the ways which promise the largest results. The question of aid is discussed in detail on the following pages but must be referred to here to round out the picture. Judiciously used, public regulation could also be made to contribute to the same end.

Aid in protection against fire, insects, and disease should meet the public obligation in full. A fair share of the technical knowledge

needed in the management of the timber and other forest resources should be obtained through research and made available through extension.

Financial obstacles, such as inequitable forest taxation, should be removed. If the necessary protection of the public interest through regulated and enforceable sustained yield management can be worked out, it might be possible to provide for loans and to allow mergers and the curtailment of production. This should strengthen the financial structure of the forest industries and help to stabilize ownership.

Increased public aid would in itself however, increase private responsibility for the productive use of the land held.

All in all, therefore, private ownership would still have ahead of it an enormous task and one which would require its maximum possible efforts.

PUBLIC AID TO PRIVATE OWNERS

ITS POSSIBILITIES AND LIMITATIONS

The granting of public aid to private owners of forest land has been in part an attempt to perpetuate the traditional American policy of private ownership by stimulating private initiative.

It is in part also a recognition of the public interest in land use, the production of timber and other products, and in the resulting economic and social benefits. This interest has local, State, regional, and national aspects.

Aid in fire protection recognized also a large public use of privately owned lands and great public indifference in the use of fire. It recognized outside risks beyond the control of individual owners. Finally, it recognized protection against fire as one of the main requirements in forestry for timber production or other purposes.

Aid in the control of forest insects and diseases recognized the highly specialized and variable technical problems involved, the very irregular occurrence of epidemics, as well as their State, regional, national, and even international aspects.

Aid in planting recognized the difficulty that small owners with periodical requirements experience in obtaining seedlings at reasonable cost. It recognized the widespread psychological appeal of planting and attempted to remove possible obstacles.

Advice in forest management attempted to offset the absence of traditional knowledge of methods of timber growing and the lack of practical demonstrations, and to overcome the inertia which handicaps an entirely new kind of enterprise.

Research attempted to recognize the handicaps indicated in the preceding paragraph, to build up a fund of knowledge and to have the public do what large numbers of small owners could not possibly do for themselves individually.

Taxation, either because of the existing form or of future uncertainties, has rightly or wrongly been held by private owners to be a primary obstacle to the development of forestry. Relief in many States has gone to the extreme of outright subsidy.

Aid began as early as 1876 in Federal research and in fire protection in New York in 1885. Marked development began in 1911 with Federal participation in fire protection, and was still further

stimulated in 1924 with the passage of the Clarke-McNary Act, which brought in various other kinds of aid. The latter was in fact a carefully considered and publicly announced effort to try out on a large scale the efficiency of aid in stimulating private owners to shoulder the major part of the job of timber growing in the United States, before attempting Nation-wide regulation or greatly enlarged public ownership.

The first decision which must be faced lies, therefore, between three alternatives. Whether—

1. Because of the success of the trial of the public-aid plan or its future promise primary dependence for the major part of the forestry job should continue to be placed on private ownership stimulated by public aid, which would probably mean a very much larger public contribution; or

2. Because of the failure of the plan or the demonstrated limitations as to its future promise, public aid should be utilized only for greater assurance of the necessary constructive private action on greatly reduced private holdings. Public aid under this plan would be considerably smaller, even though the time required for public acquisition is taken fully into account; or

3. A possible third alternative of combining public aid with public regulation will be considered under the latter heading.

The decision between the first two alternatives has been anticipated in the discussion of private ownership.

While the public has obtained fully commensurate returns from the aid so far given, the detailed data already presented show the trial of the first alternative during the last 20 and particularly the last 10 years has not been entirely satisfactory.

Private owners accept aid but too rarely carry their own efforts farther.

The devastation of forest land continues on a large scale. The deterioration of forests continues on a much larger scale. Growing stock or forest capital is reduced, when both public and private interest require that it should be increased. These processes continue both on the cut-over lands of the East and in the virgin timber stands of the West. Watershed requirements are met only to the extent that partial protection against fire can meet them. Constructive measures of forest management and reforestation by planting lag far behind the destructive processes. Ownership seems to be tending toward less rather than greater stability.

Much of the Federal aid designed to reach the private owner is turned over to the States for administration. It has been a decided or the controlling factor in the stimulation and development of a forestry organization in at least half of the States, and of aid to the private owner in practically all of the 45 States and 2 Territories where it is now given.

The stimulus to State effort has been offset in part at least by the inability or unwillingness of the States to match Federal-aid ratios. This failure is often the most serious where the need is greatest, as for example, in the South.

In general, therefore, the conclusion is inescapable that with aid in the forms so far extended, even though guaranteed in much larger amounts, private ownership will fall far short of meeting national needs.

Enlargement of existing forms of aid will be worth while. New forms will be suggested which should be helpful. These are recommended, however, under the second alternative of obtaining better results on a much smaller area of private lands.

RECOMMENDED PUBLIC AID

Public aid may take the form of Federal and State and other public aid to private owners, or of aid from one public agency to another. The former will be given first consideration.

Undoubtedly there are definite limitations beyond which such aid cannot go without becoming outright subsidy and exceeding the public obligation and interest. It should not be carried into the pork-barrel category. The recommendations recognize these limitations as well as the factors justifying enlargement.

Protection against fire should as rapidly as possible be extended over forest lands now unprotected, amounting to at least 191 million acres. Standards should be raised over practically the entire country but chiefly in the South. To meet both the objectives on private and State lands, expenditures must ultimately be increased to about \$20,000,000, as contrasted with \$7,221,000 in 1931. A large part of the increase, from \$900,000 to \$11,000,000, is in the South. Because of the size of the increase in the South an intermediate southern objective of \$6,000,000 has been recognized.

The ultimate Federal contribution in this program should be about \$5,000,000. The amount of the State contribution will vary between 75 and 35 percent in individual cases, depending upon what is obtained from private owners.

For a general forest-insect detection and control system and for special control operations on private lands public expenditures of approximately \$2,450,000 annually will be required, of which the Federal Government and the States should carry about equal parts. Private owners must contribute an indeterminate amount for actual control operations, depending upon such factors as the merchantability of trees cut.

For protection against very serious insect and disease epidemics no estimates can be made. Because of their infrequent occurrence and interstate or international character, emergency forces can best be directed by Federal agencies. The proper contribution of Federal, State, and private agencies will necessarily have to depend upon the conditions in each case.

The public contribution needed for a control service for both advisory and control work on forest diseases on private lands is estimated at about \$1,410,000 annually, with the Federal Government and the States sharing about equally.

Planting stock should be made available at about one-half cost to all industrial and farm owners. The annual Federal contribution, now \$79,960, need not exceed \$350,000 and would be used for assistance in the establishment of new and the expansion of existing nurseries and the enlargement of technical staffs. The State contribution need not be larger.

In connection with a greatly enlarged planting program, provision is necessary for the certification of forest tree seed as to source and for seed testing. It need not cost more than \$50,000 and should be handled by the central government.

While Federal forest research should be enlarged as previously recommended, it should not be extended beyond the Federal obligations already specified. Despite this limitation, the results will have important State and private-aid aspects.

Until the Federal Government has met its own obligations for research it is somewhat difficult to justify financial contributions for research on State and local problems, and the research required on local problems for the management of Federal lands can best be done by the National Government. All Federal and State work is of great value to private owners as well as in the administration of public forests. Federal expenditures will need to be increased by about \$3,000,000 and State expenditures by about \$2,100,000 during the next 10 years. The burden on the States will not be heavy, however, considering the number interested.

Advice in forest management is a form of aid urgently in need of enlargement and one to which both the Federal Government and the States should contribute.

Present Federal contributions in advice in farm woodland forestry of \$69,850 should be increased as rapidly as possible to \$250,000, and this should be matched by at least an equal amount by the States. Current State expenditures are \$92,718.

Provision should also be made for similar aid to industrial owners. The Federal contributions should be \$375,000, of which \$150,000 would be available to match State contributions on a 50-50 basis and up to \$225,000 for direct expenditure by the Federal Forest Service.

Forest taxation, a State and local function, should be placed on an equitable basis. The Federal Government should continue to assist in working out sound principles.

Other forms of possible public aid to private owners include loans, authorizations for mergers, and curtailment of output, which if allowed should be combined with regulatory requirements for sustained yield management which will protect the public interest. They will therefore be discussed under Public Regulation.

The second class of public aid includes possible aid from the Federal Government to States and from States to counties and other political subdivisions. Only the former will be discussed. Senate Resolution 175 asks particular consideration of the possibilities and desirability of Federal aid to States and implies use for the purchase of State forests.

That State action might be stimulated is recognized. But gifts are not recommended because, under the plan proposed, it is believed that the Federal Government will have about all the financial load it can carry, and because it is believed that the soundest principle is for any public agency to undertake only what it can subsequently finance. Efficiency in expenditures will be greater. Wealthy States do not need such aid. The poorer States would probably not be able without further aid to carry the forests thus acquired until self-sustaining. The wealthy States, which in the last analysis would provide the funds, might prefer to build up State forests within their own boundaries and have their contributions to Federal income go into Federally owned and managed lands, for which they would be able to watch expenditures and to demand an accounting.

Finally, Federal gifts to States for State forests would probably sooner or later lead to the political demand, as a flank attack on the conservation movement, that the existing national forests be turned over to the States.

Loans to States are subject to much the same objections. The uncertainty of repayment might well make nominal loans actual gifts.

Federal acquisition and administration of national forests have important aid aspects to State and local communities and private owners despite the fact that they were established and are administered primarily to meet national problems. It is estimated, for example, that the net annual gain to the States and counties between 1923 and 1927 from the national forests was approximately \$10,000,000.

PUBLIC REGULATION

Most European and some other countries restrict the handling of privately owned forests. Nearly all provide at least for the classification and preservation of forests necessary for watershed protection, or for the protection of the public health, or for national defense. For such purposes the owners are subject to more or less strict control. Many countries provide that other forests at least be kept in a productive condition.

In the United States practically all the States have undertaken in varying degrees to restrict the use of private forest land, chiefly to prevent injury to other persons or property. The restrictions are mainly in the prevention, suppression, and use of fire and in the elimination of fire hazards. A few States have other restrictions. The regulation of other activities, both State and Federal, is widespread, including such things as the use of wild life, water resources, the use of urban land, methods of business competition, and combinations in restraint of trade.

The public unquestionably has the right to compel private owners to desist from practices which will directly injure others or the public in general or will destroy or impair the efficiency of forests for watershed purposes. It also has the right to protect itself against waste and social loss resulting from forest devastation even where watersheds are not involved. The right to compel the maintenance of high productivity by means of desirable standards of silvicultural practice is less well established.

The need for higher standards than could probably be compelled is unquestionable.

But if the private owner is to be regulated, the public should pay its fair share of the costs of measures intended largely or solely for the benefit of others than the owners.

ITS POSSIBILITIES AND LIMITATIONS

Since private ownership has in the past largely failed in meeting national requirements and offers little more promise for the future, and since public aid in any form yet proposed apparently has very definite limitations in its possibilities of accomplishment, something more is called for. Public regulation is one of the remaining possibilities.

Nation-wide regulation in which the Federal Government and all the forest-land States join forces for maximum effectiveness could

certainly be counted on to give larger and more positive results than the combination of private ownership and public aid.

Theoretically, regulation should be effective in a much shorter time than large-scale public acquisition, the other major possibility remaining at our disposal.

Regulation promises substantial benefits to the owners themselves as well as to the public.

It should help to perpetuate the American philosophy of private property notwithstanding some curtailment in the right to utilize this property.

Of importance when taxation is such a serious burden, regulation, in at least its initial expenditures and discounting future direct returns, should cost the public somewhat less than public ownership.

But public regulation has limitations also which should be taken into account.

Since both Federal legislation and that of a large number of States would be required and might be strongly opposed, considerable time would probably be required to obtain the legislation alone. The additional time necessary to make regulation effective on the ground might give little or no advantage in time over public ownership.

The twilight zone between Federal and State effort might and probably would result in complications and weakness.

The opposition and financial weakness of private owners and the ease of defeating the enforcement of requirements on the ground might and probably would offer serious difficulties.

It would be impossible to regulate an owner who would not retain ownership, and this class might include much of the land most needing betterment.

The danger that the owners might gain control over the regulation machinery locally and nationally and use it in a way detrimental to the public interest cannot be entirely overlooked.

The best legal justification for regulation is perhaps for the protection of watersheds and for the prevention of forest devastation. Neither alone will build up forest capital or growing stock to keep forest lands fully productive and therefore fully meet national timber requirements.

Furthermore, the difficulty of obtaining legislation and of satisfactorily enforcing it might make it doubtful whether either watershed protection or the prevention of forest devastation could be fully secured for sometime to come.

The fact that regulation has largely failed in many of the States with even moderate statutory requirements, which are almost universally accepted as necessary, raises a question as to whether a Nation-wide extension would succeed.

If the principle of public aid on requirements intended largely or solely to benefit others is fully met, the cost to the public might fall so little below that of public acquisition that purchase would be preferable. Except for taxes, however, the public would under regulation get only the indirect and intangible returns and not the direct receipts which could be obtained from publicly owned lands.

All things considered, however, public regulation is one of the two possibilities which offer any real promise of meeting the major objectives set up.

THE PUBLIC REGULATION RECOMMENDED

The recommendation that chief reliance be placed on public ownership as the next major effort in American forestry eliminates Nation-wide public regulation, at least for the time being, except as a possible concurrent effort.

As a minimum, State legislation and enforcement of public regulation is desirable in the fields in which it has been most fully supported by public opinion, and should, therefore, be most enforceable. The outstanding example is in the use of fire and the elimination of fire hazards such as slash.

No discouragement should be offered to any State which desires to experiment in more comprehensive regulation.

One desirable form of extension which combines aid with regulation is that of loans. It is desirable that an effort be made in the near future to work out the possibility of loans under Federal auspices, with terms and requirements adapted to the needs of forest properties. To protect the public interest, such loans should in each instance be coupled with enforceable requirements for sustained yield management. Some such machinery as that now set up for farm loans by the Federal Farm Loan Board might be found feasible.

Still another possible extension might take the form of authorization for mergers and/or the curtailment of production, if coupled with provisions for the protection of the public interest through enforceable requirements for sustained-yield management. Although plans of this character might be worked out under State auspices, Federal authorization and control would probably in most instances be preferable. The most promising possibility may be in the Pacific Northwest, where such an arrangement, if feasible, might serve to prevent the depletion of the remaining forest capital and hence a serious future reduction in forest growth.

Both of these plans deserve serious study, that of loans as a general proposition, and that of mergers and curtailment with reference to specific conditions such as that indicated in the Northwest. Either or both may well be found to be in the interest of private owners as well as of the public.

While either or both could hardly be depended upon to bring about the rapid country-wide adoption of forestry by private owners which is necessary, they might result in stimulating an advance which would not otherwise take place.

It is possible also that the privilege of enlarged association activities might be coupled with desirable provisions for better land management.

The entire question of public regulation needs further study by both private and public agencies.

American private owners have ordinarily considered it inherently objectionable. But the preceding discussion of loans and mergers indicates that many of its aspects would be beneficial to them. Mandatory public requirements should be accompanied by enlarged public aid, a combination which would benefit both the private owner and the public. Beyond this is the probability that sustained yield management in many, if not most, cases would be far more profitable than devastation and deterioration.

From the public standpoint, regulation with the exceptions indicated could be held in reserve for possible future use in case public

acquisition lagged so seriously behind the program recommended as to jeopardize the public interest, or in case of the continued failure of private owners to keep or to bring their lands into productivity.

PUBLIC OWNERSHIP

Public ownership is the only remaining alternative for chief reliance in meeting national requirements. To be thoroughly effective, however, public ownership would require a program of such proportions that it would rank among the largest that have ever been undertaken by the American people. But under normal conditions the American people have never allowed themselves to be frightened out of a necessary program by mere size and cost.

ITS POSSIBILITIES AND LIMITATIONS

Some of the more conspicuous limitations or objections to large-scale public ownership must in fairness be pointed out in connection with the recommendation for its adoption.

Both necessary legislation and actual acquisition, even though carried through at unprecedented rates, would require time, and the urgency of acquiring large areas to prevent further depletion of existing growing stocks and further forest devastation as well as to speed up forest restoration is very great.

Large public holdings would reduce the tax base and hence the revenue of local governmental units, despite the fact that some of this reduction would be apparent rather than real, as on lands now or likely to become delinquent. It would be necessary to replace tax income in amounts sufficient to maintain local governments in desirable form by some such device as the return of 25 percent of gross receipts to national-forest counties.

Where lands which are going out of agricultural use are involved, acquisition might tend to displace the agricultural population over considerable areas.

Large scale acquisition, although a continuation of established policies, would probably encounter opposition because of its magnitude.

The total cost would be high, and unless clearly recognized as a long-term capital investment and financed accordingly would encounter the prevailing opposition to increased current costs of government.

One of the chief justifications for main reliance on public ownership in the future rather than private ownership as in the past is the extent to which the most serious forest problems of today center in or have grown out of private ownership of forest lands.

That of unstable ownership.

That of forest devastation and deterioration and depreciated forest capital.

That of excessive investments, overproduction of forest products, and economic losses to the forest industries.

That of economic and social losses to the public.

That of the lag of constructive measures to keep forest lands productive.

That of balancing the national timber budget.

That of abandoned agricultural lands suitable only for timber growing.

That of the most critical watershed conditions.

And, finally, that of the largest part of the deteriorated western forest ranges.

All of this makes continued chief reliance on private lands exceedingly precarious, despite their much larger area and better quality.

A large shift from private to public ownership seems to be the only way to carry out such a program as planting 25 million acres in the next 20 years.

Or to increase the area under intensive forestry at from 1 to 1½ million acres annually to reach 70 or 100 million acres by the year 2000.

Or to increase the area under extensive forestry by 2½ to 3¼ million acres annually to reach 279 or 399 million.

Or to enlarge the area under protection by 191 million acres to a total of 512, and to raise the ratio of actual to allowable burn to something approaching 1 to 1.

Or on 308 million acres of major and an additional 141 million of moderate forest influence to obtain fully satisfactory watershed protection.

Or to obtain satisfactory conditions on the minimum of 45 million acres which should be set aside for forest recreation.

Public ownership seems, therefore, to offer the only assured means of reaching the major forestry objectives of full forest land use, adequate supplies of forest products, and the full economic and social benefits of both, and also to make it feasible to carry out anything approaching the national planning necessary.

So, in fact, it offers the only full opportunity for the continuation of private initiative.

High initial costs should eventually under good management be offset, and more than offset, by direct financial returns and large indirect returns. The enterprise should eventually be self-liquidating from the public standpoint.

The preceding considerations, primarily the lack of assurance of obtaining under private ownership the full results needed in the public interest, and the probability of costs under public regulation, even though successful, which would fall little below public ownership, make it conclusive that a large expansion in public ownership offers the greatest assurance of meeting the public interest at probably the lowest ultimate net cost.

THE PUBLIC OWNERSHIP RECOMMENDED

Such considerations seem fully to justify the recommendation that public ownership be increased by a total area of about 224 million acres.

Public ownership of noncommercial forest lands should be enlarged by slightly less than 30 million acres to 92, this primarily for watershed protection.

That of commercial forest lands should be enlarged to meet combined timber production, watershed protection, recreation, and general economic and social needs by about 194 million acres, including slightly less than 32 million acres of abandoned farm lands. This would mean public holdings of 293 million acres, or about three fifths instead of the present one fifth of the total area of commercial forest. (Figs. 25 and 26.)

Of the total area recommended 177 million acres are in the East and 47 million in the West.

Rapid exploitation of the remaining virgin stands is under way in the West. To prevent the repetition of the depletion of forest capital,

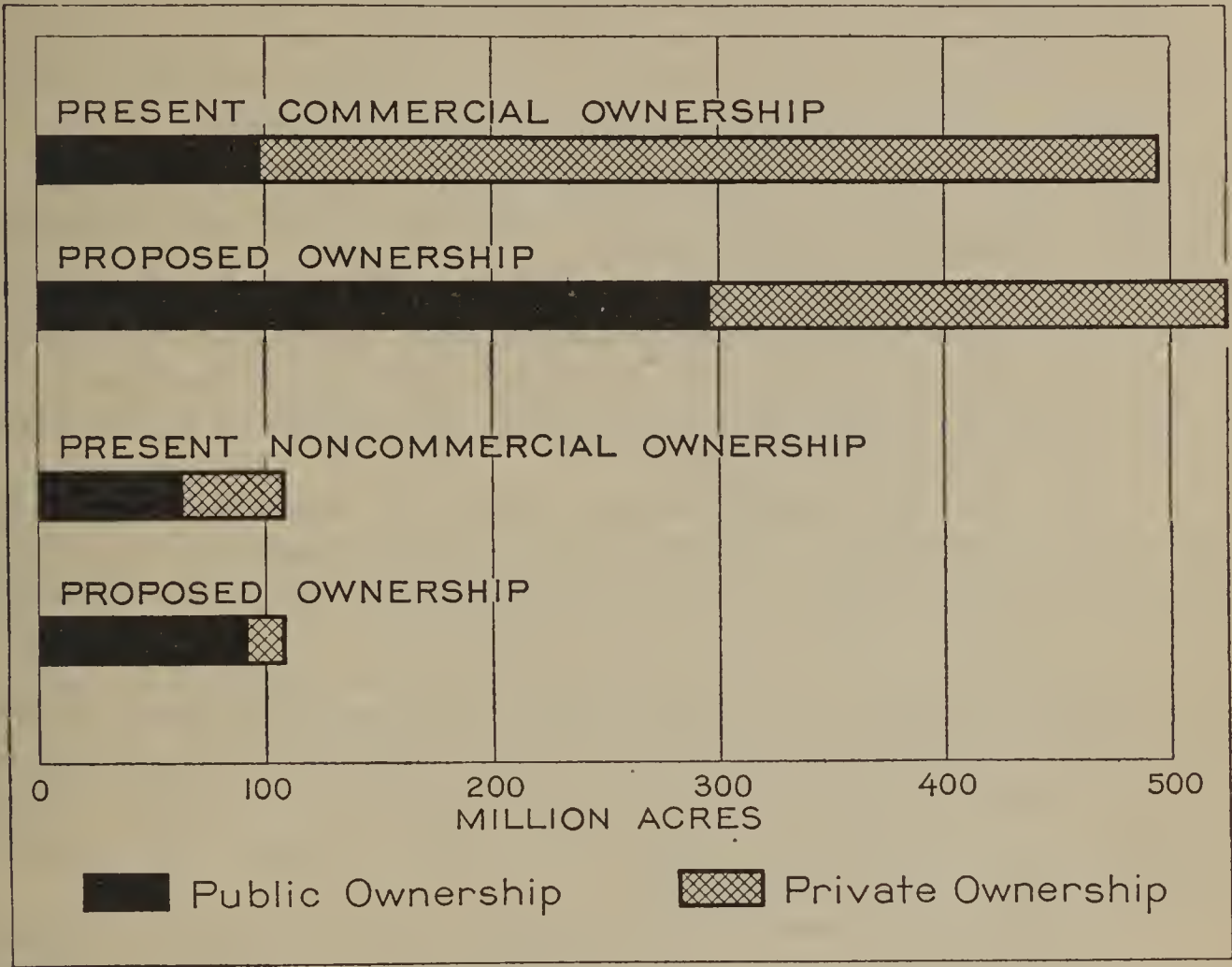


FIGURE 25.—Present and proposed ownership of commercial and noncommercial forest land. The increase in public ownership of commercial land from 99 to 293 million acres is to meet combined timber growing, watershed protection, recreation, and economic and social requirements.

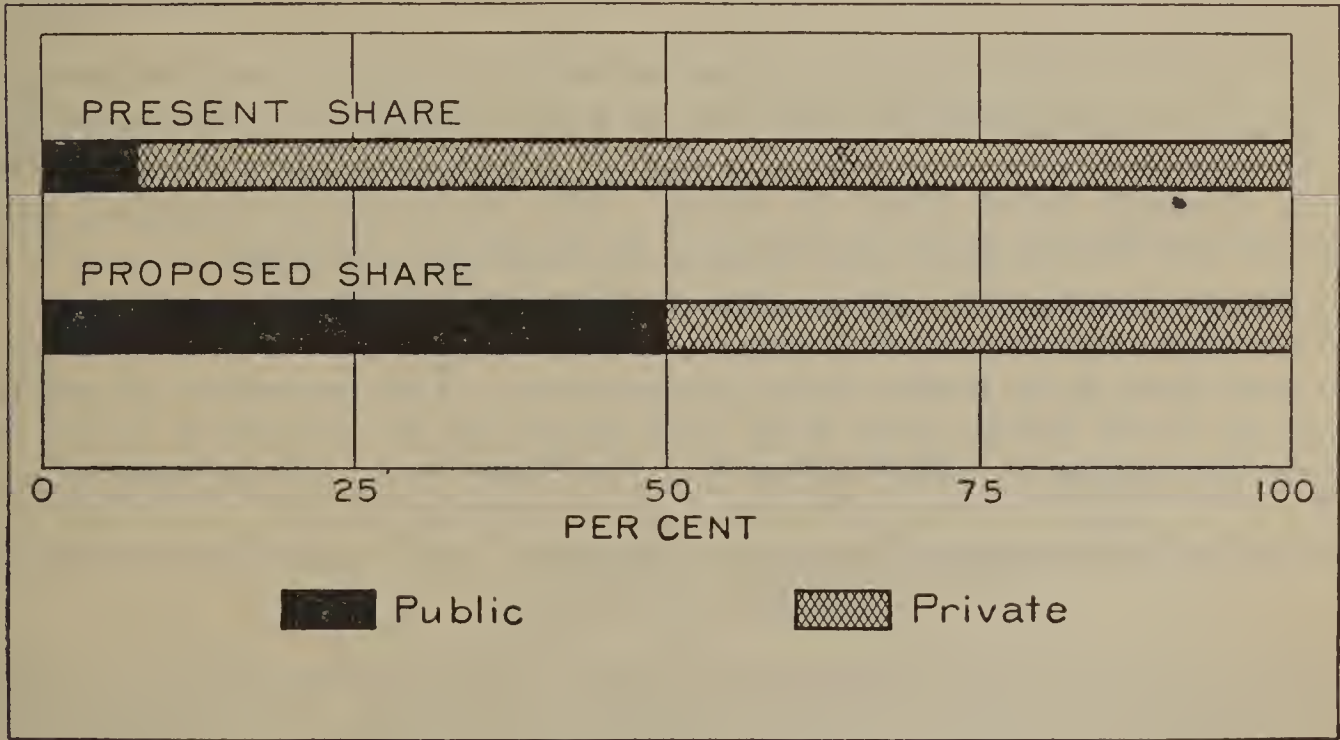


FIGURE 26.—The timber-growing job. The best assurance of meeting future timber requirements is for the public to take over a much larger share of the job than the present 10 percent or less. The area of commercial land recommended will make possible the half shown in the diagram.

which has been universal throughout the East under private ownership, public acquisition of at least 90 billion board feet is justified. Investments should be self-liquidating; wholly disregarding public losses, the cost of rehabilitation of wrecked forest land would be

much greater. This part of the task would probably fall primarily on the Federal Government.

The governing principle for the division of the task between the States and the Federal Government should be for the latter to take over only the part that the States and their political subdivisions cannot or will not carry.

On the assumption that the most wealthy States and their subdivisions will on the average be able to carry 80 percent of the full program and the least wealthy only 20 percent, about 40 percent, or 90 million acres, would be the States' share, and the remainder, or 134 million acres, the Federal share.

The cost of the total acquisition program will be materially influenced by the area acquired by tax reversion, the way in which the program is handled, and the prices paid for the land purchased. It may amount to as much as \$750,000,000, two thirds of which would fall upon the Federal Government.

Even under normal conditions an early start and the most rapid possible consummation of the program would be justified to prevent further forest devastation and the deterioration and their inevitable results and to start the process of rehabilitation.

The depression makes such action much more urgent to relieve serious unemployment. The depression has made the national-land problem much more acute, and thus emphasized the need for making forest-land use contribute as fully and as soon as possible to its solution. Present prices of land and timber would also greatly reduce the total cost of acquisition.

It is believed both possible and desirable for the Federal Government at least to acquire cut-over land at the rate of 5 percent, or about 7 million acres a year, and western stumpage at the rate of about 9 billion board feet over a 10-year period. The yearly cost to the Federal Government for the first 10-year period would average about \$30,000,000.

The time is ripe and the entire situation calls for an acquisition movement equal in aggressiveness but greater in magnitude than that which characterized the building up of the national forests from the public domain from 1905 to 1910. The Federal Government and most of the States must participate to make it a success.

It should be the next great step in American forestry.

With the acquisition of the land public obligations will only begin. The real task is to make them productive. The intensity of public effort on both lands now held and those to be acquired must be greatly increased to offset what has not been done by private effort.

THE COST OF THE NATIONAL PLAN AND HOW IT COULD BE FINANCED

Expenditures for all forest activities in the United States in 1932 as previously indicated totaled about \$43,475,000. Of this amount about \$24,375,000 was expended by the Forest Service, \$2,600,000 by other Federal agencies, and \$10,650,000 by State and other public agencies. Quasi public and private agencies spent about \$5,860,000.

THE COST OF THE PUBLIC PROGRAM

The most important steps in the public program call for increased State and Federal effort in (1) enlarging and (2) managing public forests and (3) strengthening public aid and research.

TOTAL COSTS

The estimated total average annual expenditures required by State and local governments, the Federal Government, and by all public agencies to carry out the program recommended are given in table 1. Subsequent expenditures in all cases would be maintained at the rate of the fourth period.

COSTS SUBDIVIDED

Table 2 shows what the State and local money would be used for.

TABLE 1.—Total average annual expenditures by all public agencies to carry out program recommended

Period	State and local govern- ments	Federal	All public
First 5-year period.....	\$32, 900, 000	\$83, 800, 000	\$116, 700, 000
Second 5-year period.....	47, 600, 000	95, 100, 000	142, 700, 000
Third 5-year period.....	45, 300, 000	64, 400, 000	109, 700, 000
Fourth 5-year period.....	38, 300, 000	55, 700, 000	94, 000, 000

TABLE 2.—Distribution of average annual expenditures for State and local forests

Period	Acquisition and manage- ment of existing and new forests ¹		Other State activities, aid, research, etc.
	Total	Capital in- vestment	
First 5-year period.....	\$24, 200, 000	\$21, 800, 000	\$8, 700, 000
Second 5-year period.....	35, 600, 000	31, 200, 000	12, 000, 000

¹ Total area 100 million acres.

Similar estimates in table 3 give the distribution of Federal expenditures on the 317 million acres of present and proposed national forests and for other Federal activities:

TABLE 3.—Distribution of average annual Federal expenditures on existing and new national forests and other Federal forest activities

Period	Forest service					All other Federal activities ³
	Existing national forests ¹		New national forests ²		All other activities, aid re- search, etc.	
	Total	Capital in- vestment	Total	Capital in- vestment		
First 5-year period.....	\$25, 500, 000	\$17, 200, 000	\$46, 900, 000	\$42, 900, 000	\$7, 100, 000	\$4, 200, 000
Second 5-year period.....	22, 900, 000	14, 300, 000	60, 200, 000	51, 400, 000	9, 200, 000	⁵ 2, 900, 000
Third 5-year period.....	13, 100, 000	4, 500, 000	44, 800, 000	32, 800, 000	⁴ 4, 700, 000	⁶ 1, 700, 000
Fourth 5-year period.....	13, 100, 000	4, 500, 000	36, 200, 000	22, 000, 000	⁴ 4, 700, 000	⁶ 1, 700, 000

¹ Management and protection on 161 million acres.
² Acquisition of 134 million acres and management on 156 million acres.
³ Protection of parks, Indian lands, etc., aid, and research.
⁴ Does not include research expenditures which are estimated for the first 10 years only.
⁵ Does not include Bureau of Plant Industry expenditures which are only estimated for 5 years.
⁶ Does not include estimates for Indian reservation and national park forests, expenditures for which are estimated for the first 10 years only, and Bureau of Plant Industry expenditures which are estimated for 5 years.

That the proposed expenditures are largely for capital investment in extending, improving, and making productive publicly owned municipal, State, and national forests is shown by the following tabulation of percentages of capital investment of gross charges:

	Percent
First 5-year period.....	71
Second 5-year period.....	68
Third 5-year period.....	57
Fourth 5-year period.....	44

The proposed capital investments may be further segregated into two categories, (1) land acquisition, (2) improvements such as physical plant, roads and trails, and cultural operations including such items as planting, stand betterment, insect and disease control, etc., as shown in table 4:

TABLE 4.—*Distribution of average annual capital investment in Federal, State, and local forest land by 5-year periods*

NATIONAL FORESTS, EXISTING AND ENLARGED

Categories	First period	Second period	Third period	Fourth period
Purchase of land.....	\$29, 500, 000	\$29, 500, 000	\$19, 500, 000	\$19, 500, 000
Improvements, roads, trails, cultural operations, planting, stand betterment, etc.....	30, 700, 000	36, 200, 000	17, 800, 000	6, 900, 000
Total.....	60, 200, 000	65, 700, 000	37, 300, 000	26, 400, 000

STATE AND LOCAL FORESTS, EXISTING AND ENLARGED

Purchase of land.....	\$12, 800, 000	\$12, 800, 000	\$12, 800, 000	\$12, 800, 000
Improvements, roads, trails, cultural operations, planting, stand betterment, etc.....	9, 000, 000	18, 400, 000	12, 300, 000	2, 100, 000
Total.....	21, 800, 000	31, 200, 000	25, 100, 000	14, 900, 000

THE COST OF THE PRIVATE PROGRAM

Because of the large number of private owners of forest land, an estimate of the total cost of the private program would be meaningless. Furthermore, only meager data are available as a basis for such an estimate.

Costs will vary from the farm wood lot requiring only incidental time from the owner and no cash outlay, to the areas under intensive management. The latter may vary in different parts of the country and under different conditions, from 35 cents to \$1.15 per acre annually.

In timber management, however, apparent costs may be actual savings. In most cases satisfactory returns cannot be expected without corresponding expenditures.

HOW THE PROGRAMS COULD BE FINANCED

An important factor in the consideration of how the program outlined could be financed is the possible income from managed forest lands.

THE POSSIBLE INCOME FROM MANAGED FOREST LANDS

In forecasting possible income a situation different from that now existing must be visualized. Over rapid exploitation of virgin timber rather than continuous production of organized forest properties, has created a false impression that timber supplies are still abundant.

The reduction of the growing stock for the entire East far below that necessary for full productivity and a current rate of growth well below market requirements indicate that whenever most forests are placed on a sustained yield basis the market condition will be one of scarcity rather than of surplus. The time when these favorable market conditions will occur depends in part on the rate of abandonment of the liquidation policy, or if it is not abandoned, when liquidation of the major portion of private holdings is completed.

Owing to uncertainties such as this no accurate forecasts can be made of the time when full financial returns can be obtained from timber management. In some favorably situated forests these returns can be realized quickly without waiting for cessation of the liquidation process. In forests still endowed with growing stock, the returns might be realized within 20 to 40 years. But areas devoid of growing stock cannot be brought to full productivity in less than 50 to 80 years.

Estimated returns from timber management are based primarily on the stumpage values of 1928 to 1930. Regional growth, acreages of intensive and extensive timber management, the distribution of production to private, State, and Federal activity are those set up for the purposes of this report.

The possible gross financial returns from a timber management program to produce 17 to 18 billion cubic feet annually, not including returns from logging, manufacturing, etc., are shown in table 5. Possible returns for grazing, recreational, and other uses are also shown. For public forests a conservative estimate is included for recreational use and watershed management based on the principle that the chief beneficiaries should bear a commensurate part of the cost.

TABLE 5.—*Estimated possible annual returns from Federal, State and local, public and private timber management and other forest uses and services*

Use of service	From private forest lands		From State and local public land		From Federal land	
	Area	Return	Area	Return	Area	Return
Intensive timber management	<i>Acres</i> 40, 000, 000	\$140,000,000	<i>Acres</i> 10, 000, 000	\$24, 000, 000	<i>Acres</i> 20, 000, 000	\$50, 000, 000
Extensive timber management	150, 000, 000	300,000,000	35, 000, 000	30, 000, 000	90, 000, 000	84, 000, 000
Grazing, recreational, and other uses		50,000,000		10, 000, 000		26, 000, 000
Total		490,000,000		64, 000, 000		160, 000, 000

These possible rates of income from a fully restored and productive forest resource would permit ample expenditures for forest protection and other production costs and still leave net returns well in excess of \$400,000,000 to \$500,000,000 annually.

Such returns indicate a capital value of \$10,000,000,000 or more for the forests, not including the large manufacturing and other de-

pendent industrial values, as a permanent part of the Nation's natural resource wealth.

THE FINANCING OF CURRENT AND CAPITAL EXPENSES

The expenditures needed to carry out the program outlined, whether public or private, fall into two classes which suggest different methods of financing.

The first is current expenditures for carrying on everyday productive business such as costs of fire protection and of logging and milling.

The second is capital investments such as the purchase of additional land, planting, and road construction for increasing the capital assets.

The logical way for private owners to meet current expenditures is from current income from surplus, or from working capital borrowed on short-time loans anticipating current income.

For public agencies the logical way to meet current expenditures is by appropriations from actual or expected Treasury income or if necessary short-term borrowing.

For capital investments for Federal and State forests, long-term loans at a low rate of interest would afford the means for underwriting desirable projects beyond the immediate capacity of Treasury income.

Capital investments for private owners might be carried very advantageously under some such plan as that proposed for the enlarged field of the Federal Farm Loan Board.

THE MOST IMPORTANT LEGISLATION REQUIRED

BY THE STATES

The most important legislation required by the States to carry out the national plan and programs recommended will include laws—

Establishing State forest organizations where they do not exist, and strengthening those which are now handicapped by uncertainty of civil-service tenure or by political interference.

Establishing programs on a long-time basis both for the acquisition of lands as State forests and parks, and also wherever desirable for the management and administration of both existing and acquired lands.

Clearing up the status of tax-reverted forest lands, or submarginal agricultural lands suitable only for forests, accepting the inevitability of public ownership, providing for blocking into State or local forests those suitable for public ownership, and providing for their management and administration.

Similar laws for other State forest lands now in uncertain status. Authorizing Federal acquisition by purchase or otherwise for national forests where desirable or necessary and not already provided.

Providing for State-wide organizations for fire control.

Strengthening existing regulatory forest fire laws by providing reasonable safeguards for the legitimate use of fire, and with provision for the punishment of carelessness, neglect, or arson.

Providing for the necessary protection of forests against damage from insects, diseases, acts of trespass and other injury, or

where necessary in the public interest for the regulation of management.

Providing for the equitable taxation of forest land.

BY THE FEDERAL GOVERNMENT

The most necessary Federal legislation to carry out the programs recommended in the national plan will include—

An authorization bill to put on a long-time program basis—

1. The acquisition program.
2. The appropriations necessary for the management and administration, protection, and development of the existing and proposed national forests, if further consideration shows such an authorization to be desirable.

Authorizing acquisition of private land through exchange within 6 miles of the boundaries of the existing national forests.

Adding about 22 million acres of public domain to the national forests.

Recognizing recreation as a major national forest use as provided in H.R. 58, Seventy-third Congress.

Modifying the McSweeney-McNary Forest Research Act—

1. Increasing the annual authorization for the Forest Survey to \$500,000, and including a supplemental authorization of \$200,000 for keeping data current after the completion of the initial survey.
2. By the addition of a section providing for erosion-stream-flow investigations with an annual authorization of \$500,000.
3. By the addition of a section providing for work on the forest-land phase of land classification, unless it later proves more desirable to provide for it in general land classification legislation; and including an annual authorization of from \$250,000 to \$400,000.

Modifying the Clarke-McNary Act to authorize Federal expenditures, in cooperation with the States, of—

1. Not to exceed \$5,000,000 annually in forest-fire cooperation instead of \$2,500,000 as at present.
2. Not to exceed \$350,000 annually to furnish forest tree seedlings to all classes of owners instead of the present \$100,000 to furnish them only to farmers; also \$50,000 for a Federal seed testing and certification station.
3. Not to exceed \$250,000 annually instead of \$100,000 in farm woodlot extension.
4. Not to exceed \$375,000 annually in advice on forest management to industrial owners, \$150,000 of which would be available for cooperation with the States.
5. Not to exceed \$250,000 in the control of insect attacks.

Authorization to the Bureau of Plant Industry, through its Blister Rust Division, to cooperate in the control of forest diseases, other than the white pine blister rust.

Authorization to the Secretaries of Agriculture and Commerce to provide expert assistance, and to cooperate with other agencies in wild life and fish activities and in developing a Nation-wide program of game conservation. Such legislation is embodied in S. 263, Seventy-second Congress.

THE ESSENCE OF THE NATIONAL PLAN

One of the most important aspects in the history of American forestry during the last 20 years has been a trial on a large scale of the relative effectiveness of private and of public forest-land ownership.

Private ownership has held four fifths of our commercial forest land with from 90 percent or even more of the total potential timber growing capacity. It has held the agricultural land which is being abandoned. It has also held two fifths of the noncommercial forest land. Practically all of the major forest problems of today have grown out of this ownership. As measured by expenditures only about 10 percent of the constructive effort in American forestry is being made by it. Nearly half of this effort is so remote as to have little or no influence on the forest itself. Sustained yield management would probably have yielded higher profits to the owners under many if not most conditions than forest devastation and deterioration. Private ownership has had the benefit of substantial if not wholly adequate public aid. It has also had the benefit of regulatory laws, chiefly protection against fire.

Public ownership, mainly in the national forests and State forests, has held three fifths of the noncommercial but only one fifth of the commercial forests. It has been characterized by the administration of the forest resource in the public interest and by the adoption of the principle of fully coordinated sustained yield management of the different elements of the forest resource. It has won its way through public condemnation to general public recognition and approval.

As measured by expenditures the public contribution represents nearly 90 percent of the total constructive effort by all agencies to the solution of the forest problem, and two thirds of this has been concentrated on the relatively small part of the land which the public has owned.

The effort on the public forests still falls short of what is needed. From the standpoint of national coordination, however, the concentration of the major part of the constructive effort on a relatively small part of the poorer land in public ownership and the concentration of a large part of the better land in private holdings which receive only a relatively small part of the constructive effort, shows a critical lack of balance. (Fig. 27.)

The plan recommended must go as far as feasible in attempting to correct this lack of balance. No national plan based on realities can do otherwise than take the results of the trial of the two forms of ownership seriously into account. The essence of the plan recommended is, therefore, in part, that the public should in the shortest possible time take over at least half of the national enterprise in forestry.

More specifically this would mean—

Slightly more than half of the commercial forest land.

Half of the timber-growing job.

Five sixths of the noncommercial forest land.

Three fifths of the forest ranges.

Four fifths of the area of major influence on watershed protection.

Eight ninths of the areas to be set aside for forest recreation.

These relationships are also expressed graphically in figure 28.

This recommendation would still leave to private ownership much more of an undertaking than it has yet faced, under conditions even

more favorable for its success than in the past, with increased public aid, and hence with far greater responsibility.'

The ultimate public holdings of forest land, totaling 393,000,000 acres, would be divided between the Federal Government and the States in about a 3 to 1 ratio.

On this modified distribution of ownership as a foundation falls the task and the responsibility of building a superstructure of the

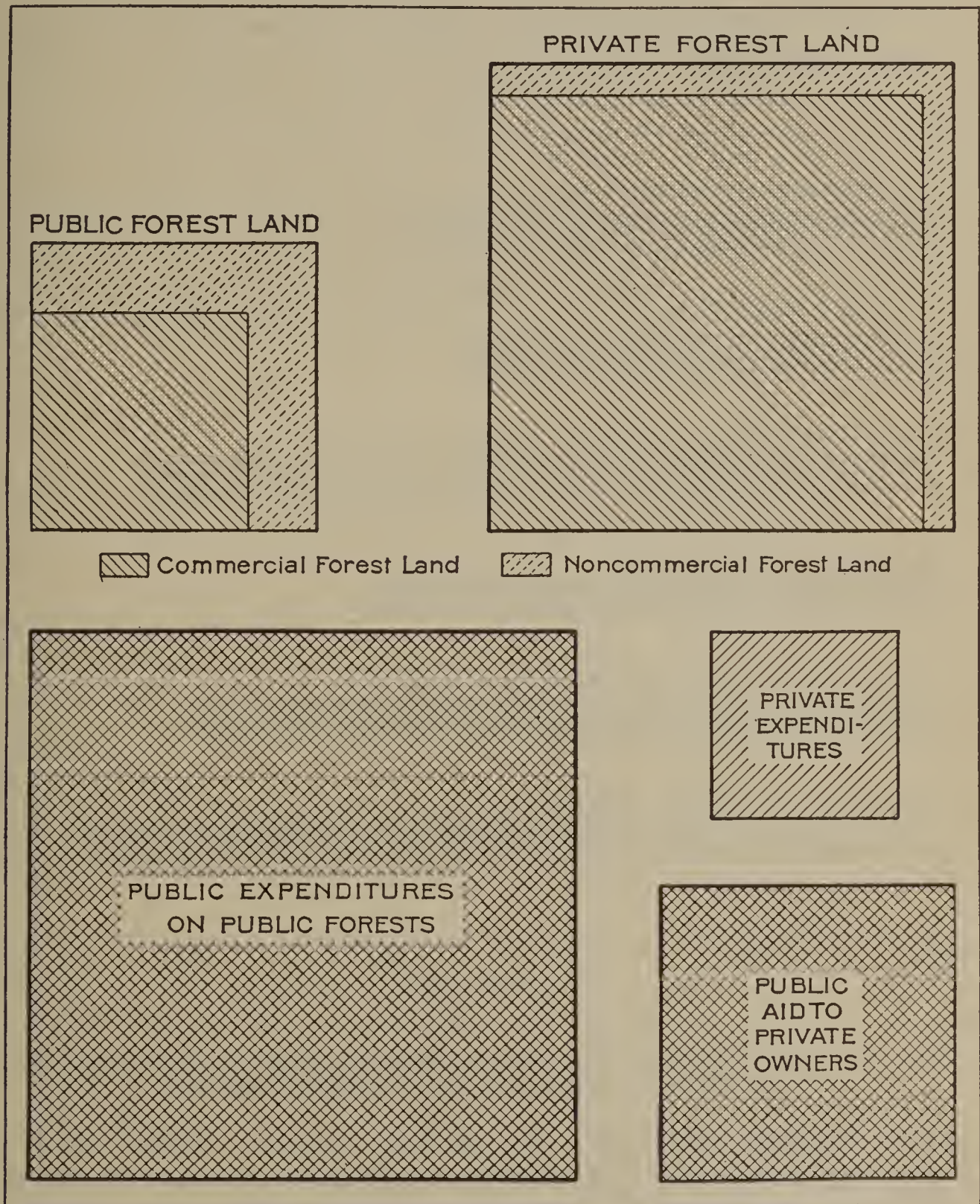


FIGURE 27.—The critical lack of balance in ownership and effort on public and private forest land.

activity programs which constitute an essential part of the national plan. These programs cover the entire range of the management, protection, and administration of the timber, watershed, recreational, wild life, forage, and other resources which make up the forest, and are designed to make the forest meet the objective set up of full economic and social service.

Resolution 175 lays particular stress on a coordinated plan for meeting the entire forestry problem. That recommended is the

best that can now be formulated dealing with the following major considerations:

1. The distribution of forest land between private and public ownership, and in the latter class between State and Federal ownership. The plan proposed is in broad terms and affords the opportunity to work out the detailed adjustments between private and public ownership and between the different classes of public ownership which are best adapted to local conditions and requirements.

2. Public aid that stays within the public interest, that is equitable between the Federal and State Governments, and yet offers the

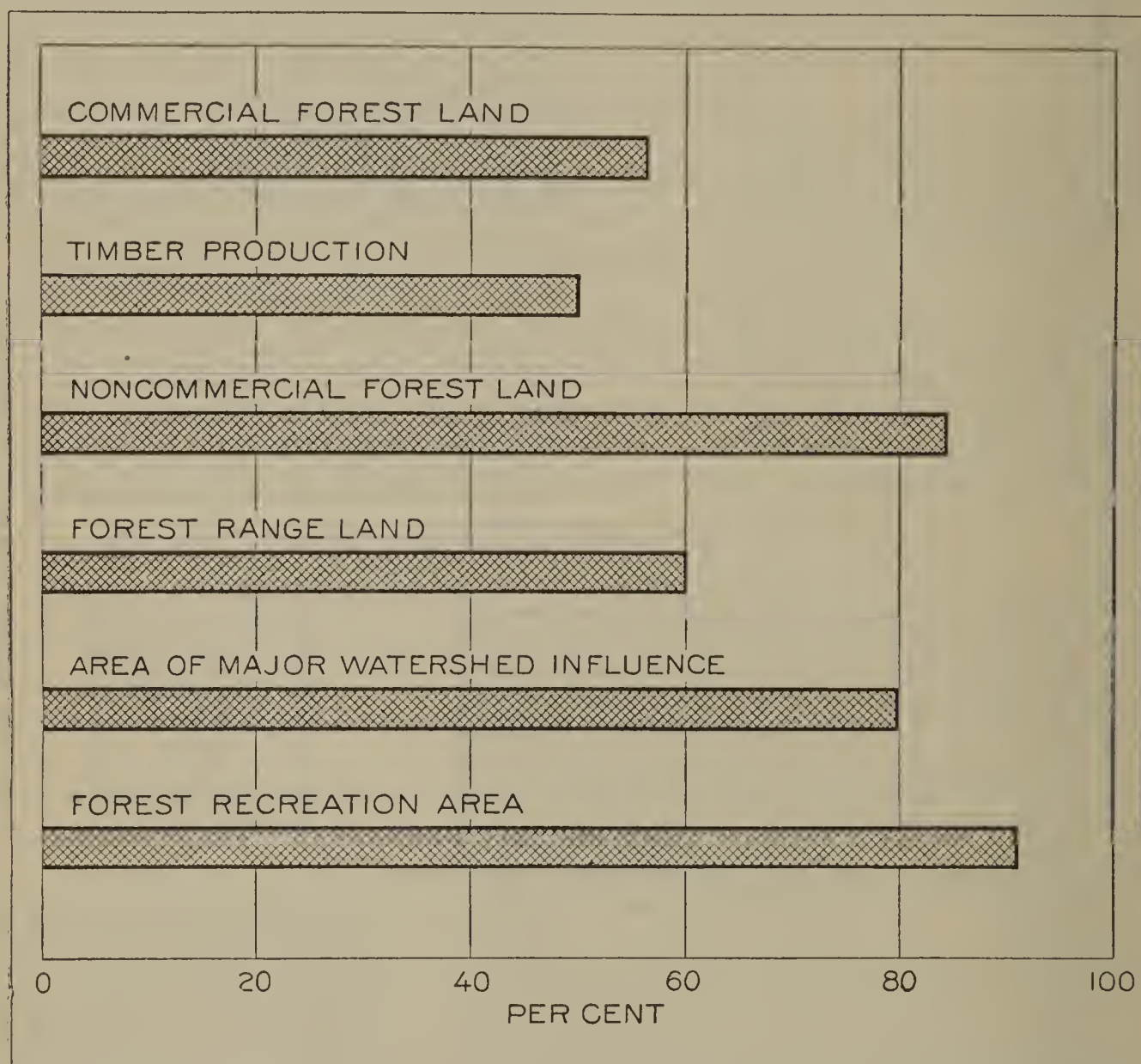


FIGURE 28.—The proportional public share in different phases of the forestry enterprise under a coordinated national plan—growing out of direct ownership of forest land.

greatest feasible assistance to private owners. Here also great opportunity is left for flexibility in application to meet local needs.

3. Public regulation that would cover generally accepted requirements, attempt nothing impossible, be available as a quid pro quo in the public interest for concessions to private owners, and finally, be available as a reserve measure in case of future public necessity.

4. Federal assumption of only that part of the undertaking which other agencies cannot or will not carry, but where necessary assumption to the full extent of the national interest.

The main obstacle to immediate action toward the consummation of this plan is the financial stringency of governments resulting from the depression. Undoubtedly the long-continued series of mistakes in forest-land policies and management has been one of a large group

of economic and social maladjustments which have been at least a contributing cause of the depression.

Relief must be provided anyway. It will be far better if the relief can strike at fundamental causes and attempt the solution of national problems than if it is confined to purely transient measures. Since idle men can hardly be left to starve, it will be far better to put them to work on constructive public works. Should it prove desirable from the standpoint of relief the program can be carried out more rapidly than indicated.

Any attempt at national planning must provide for the recognition of changing conditions. One of the essentials in forest land use is, therefore, periodic revision of national plans such as here recommended, perhaps as often as every decade. This will afford the opportunity to consider not only the then existing conditions, but also to take fully into account the more and more authoritative factual data which it has been possible to accumulate, and the more and more conclusive results shown by practical trials on a large scale of different systems for meeting national objectives.

INTRODUCTION

This report is submitted in pursuance of Senate Resolution 175, Seventy-second Congress, first session, introduced by Senator Royal S. Copeland and agreed to by the Senate March 10, 1932. This resolution is as follows:

Whereas the consumption of the forests of the United States has progressed to a point at which their early exhaustion is threatened; it being estimated (1) that over 50 per centum of all the softwood lumber cut in the United States has been cut during the last thirty years; (2) that, with a population almost 60 per centum greater today than at the beginning of the twentieth century, the United States has been using nearly three hundred billion feet of softwood lumber alone during each decade since 1900; (3) that in 1928, with a population of more than one hundred and twenty million, the annual cut of softwood lumber alone was twenty-eight billion feet; and (4) that there now remain in the territory east of the prairies, only about twenty-five billion feet of original timber; and

Whereas there are great areas in the United States, which, aside from their underlying minerals, are suitable for forestation only; it being estimated that of the great land area constituting the thirteen Northeastern States, from Maine to and including the two Virginias, about one half, or seventy-five million acres, are suitable for forestation only; and

Whereas proper utilization of such lands as a public domain under proper control, would to some extent effect a modification of the climate, substantially effect or control the run-off of water, supply a cheap and dependable supply of lumber, and, through development, with roads, camping places, leased hunting and fishing rights, and other opportunities for social activities, would afford valuable resources for entertainment and improvement in national health, besides giving wealth-producing and steady employment to a large number of persons; and

Whereas it is desirable (1) that a coordinated plan be immediately developed for the cooperation of the Federal and State Governments in the utilization of such lands suitable for forestation only; (2) that information necessary as a basis of legislation be compiled; and (3) that recommendations for legislation be made: Therefore be it

Resolved, That the Secretary of Agriculture is requested (1) to advise the Senate as soon as practicable whether, in his opinion, the Government should undertake to aid the States in the utilization for forestation purposes of those areas of land in the United States suitable for forestation only, and (2) to state fully his reasons for any opinion which he may submit, together with the facts upon which such opinion is based.

The resolution stresses—

1. The threat of early exhaustion of our timber supplies, particularly of softwoods in the East.

2. The existence of large areas of land suitable only for the growing of timber.

3. The fundamental and far-reaching benefits, economic and social, which would be afforded by the wise utilization of such lands under public control.

4. The desirability of developing immediately a coordinated Federal and State program for the utilization of these lands, and asks

5. That the Secretary of Agriculture advise the Senate whether the Federal Government should aid the States in such a program, and as to the facts and reasons upon which the conclusion is based.

This report, dealing as it does with one of the most important and far-reaching forms of land use, comes at a peculiarly opportune time.

The economic upheaval of the past three years has focused attention upon critical and perplexing problems of a social-economic nature that have arisen, or have come to a head during the postwar period. Public opinion is more receptive than ever before to the inauguration of carefully planned land utilization, both nationally and regionally.

Many of our most pressing problems are not of recent origin, but rather are the result of long-continued maladjustments of a fundamental nature. The Nation has grown, and grown rapidly. Practically unhampered private initiative has characterized all fields of endeavor. The genius of our people in developing and exploiting our unparalleled natural resources has made us the wealthiest of nations. But the very nature of this energetic application of effort, and its cumulative wastage of resources, has led inevitably to a current situation in which the serious lack of proper coordination between important economic and social factors seriously threatens our future prosperity.

All major plans and efforts for restoring and maintaining a state of prosperity free from periodic disruption should recognize the necessity for an adjustment of industrial practices to the requirements of social welfare and the correlation of both with the basic sources of the Nation's wealth. Agriculture, lumbering, and mining have been the primary industries based directly upon the products of the land, and have furnished the Nation's main sources of wealth and opportunity. Generally speaking, the Nation has, however, pursued a policy of unlimited, undirected, and often wasteful land use. It is evident that this time-honored policy has been too long continued, and that a definite policy involving carefully planned land utilization is necessary.

This report, while confined to the field of land use for forest purposes, has been prepared with the conviction that full and wise use of our land resource as a whole is essential to the Nation's future welfare, and with the recognition that forest use affects and must ultimately be harmonized with, the plans for agricultural and other major uses of land.

An ample and economically available supply of timber products for the needs of our people has always been, and should remain, a major purpose of forest-land use. But the problem reaches much further than that. Forest use evidently offers the only practical means of utilizing vast areas which by and large are adapted to no other major economic use. Forestry as a means of economic land use has been emphasized during the last decade by such developments as:

1. The growing accumulation of cut-over forest land stripped of its immediate timber value, evidently not needed for agriculture, but left to a precarious future with small hope of making its due contribution to the Nation's income.

2. The breakdown of private ownership of both agricultural and forest land. The fact that much land once cultivated is proving to be submarginal for agriculture promises to make available for forestry a much larger area than has previously been seriously considered or planned for. The withdrawal of private ownership is creating problems of involuntary public ownership and management of forest lands.

3. The growing appreciation of the far-reaching importance of forests for watershed protection, recreation, wild life, and forage; and

of the important part that the growing and harvesting of forests and the distributing and marketing of forest products plays in the economy of many communities and regions.

To carry out the mandate of the resolution it is necessary to outline a program coordinating the efforts of Federal, State, and private agencies in attacking the problems of forest-land use. Such a union of strength, while not a new departure in American affairs, has not as yet been satisfactorily accomplished in this field, but is none the less necessary.

The formulation of a national policy and program involves many complications. It is possible to formulate the policy and program and to present the facts upon which they are based, only by means of a careful review of various controlling aspects of the forest situation. This report, therefore, analyzes the situation as to forest land and timber supplies with respect to such things as character, ownership, availability, and present and potential timber-producing capacity; and it associates these aspects with the drain that is taking place on our forests, and with present and potential needs for timber products. It appraises the use of forest land not only for growing timber, but also with respect to the importance and the requirements of watershed protection control, recreation, wild-life production, and forage. These are treated as multiple uses, several or all of which usually apply in varying degree to the same tract. The status and progress of forestry under private and under various forms of public ownership are reviewed, the status and results of Federal and State aid are considered, and existing programs and policies are weighed. The already extensive experience of the Federal and some State Governments in managing forest lands is highly significant in pointing a way to work out the problem.

Upon this essential factual foundation the report sets up a group of coordinated national programs, each designed to accomplish the needed results in the particular field dealt with. The recommended division of responsibility by agencies, public and private, is set forth. The report proposes an immediate program for Federal and State legislation, appropriations, and other action. In this coordinated program public acquisition and management occupy a central position interrelated with all other phases.

In brief, the report is a searching reexamination and restatement of our Nation's forest problem; an analysis of the actual and potential values of forest land and its uses in relation to our national, social, and economic structure; and a constructive program for necessary action featuring Federal and State cooperation and forest land acquisition and administration.

The report has given less detailed consideration to the more immediate, and in some respects transitory, problems of the lumber and other forest products industries, which have to do with excess industrial capacity, heavy carrying charges, the merger of private ownerships, interstate compacts, etc. Not only has time not been available for thorough study and matured conclusions on such essentially industrial problems, but important though these are, their treatment is not vital to the purposes of the resolution, and of this report. These subjects, moreover, were included in the program of President Hoover's Timber Conservation Board. Nor has time permitted study of the important and involved relations of transportation and

distribution costs and methods to the question immediately concerned, nor of tariffs and international economic relations in general.

Improved forest taxation has generally been recognized as an essential feature of any comprehensive forestry program, and it bears directly upon the feasibility of private forestry and upon the coordination of public and private forest land ownership. This problem, which in turn is intimately associated with the whole problem of local taxation and governmental organization and administration, is the subject of a thorough investigation by a special staff, known as the "Forest taxation inquiry of the Forest Service." A comprehensive report by that staff is practically completed and will shortly be available. This obviates the necessity for dealing with the matter in the present report.

The problem of adequate professional forestry training to supply men competent to work out the solution of the forest problems, and to practice forestry under American conditions has for some years been recognized as meriting special consideration. It has not been so much a question of quantity of professional training, as of focusing such training upon, and coordinating it with, the needs peculiar to this country. A recent publication entitled "Forest Education" by Henry S. Graves and Cedric H. Guise, made possible by a grant from the Carnegie Corporation, and conducted under the auspices of the Society of American Foresters, covers this subject, which, therefore, is not dealt with further in this report.

The data incorporated in the factual sections of this report and which underlie the recommendations herein set forth, are based, to the extent they are available, upon the findings of scientific studies and investigations. Other data, and this applies particularly to those dealing with forest land, forest volumes, growth, requirements, etc., represent the best information available from whatever source, checked by the judgment of well-informed men in the various regions. They do not, in most instances, involve detailed accuracy. The fact is that in the matter of data on these specific aspects of present and potential forest supplies and requirements, there is the greatest need for a thorough-going inventory and analysis as a basis for the development of plans by private owners, and of policies and programs by public owners regionally and nationally.

In supplying and presenting factual information, and in formulating programs and recommendations, many agencies and individuals have participated. These include, beside the Forest Service, such bureaus in the Department of Agriculture and in other Departments as the Bureaus of Agricultural Economics, Entomology, Plant Industry, the Biological Survey, the Bureau of Fisheries, the Office of Indian Affairs, and the National Park Service; also State foresters, and other State officials, as well as private individuals and agencies.

This report deals with conditions that are changing, with trends that have altered and are still changing. By the nature of its contents the detailed facts are, in many respects, transitory. Even though many of the data are approximations, they have been used carefully, and with a liberal margin of conservatism in the conclusions. The broad outlines of the picture of the forest situation are too clear to be obscured by inaccuracies in the data. The programs recommended are presented with confidence that they are justified, and in fact vital, from the standpoint of public welfare.